Getting Started with the Livescribe Platform SDK

Livescribe™ Platform SDK
Version 1.0.1

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Preface

About this Document

This document, *Getting Started with the Livescribe Platform SDK*, describes how to get started using the Livescribe Platform SDK to develop penlets for the Pulse™ smartpen. It discusses the contents of the SDK and what kind of penlets you are permitted to develop. It then describes how to set up your IDE (Integrated Development Environment) and create some simple Hello World penlets. Finally, it provides reference information on the wizards, views, and dialogs of the Penlet perspective within the IDE.

About the Platform SDK Documentation Set

The Livescribe Platform SDK documentation set includes the following documents in PDF format.

Introductory Documentation:

- Read Me First: introduces the components of the Livescribe Platform, lists system requirements, and provides download instructions.
- *Livescribe Developer License Agreement:* The Livescribe license agreement for third-party developers, in TXT and PDF formats. All developers must accept this agreement before downloading the Platform SDK.
- *Introduction to the Livescribe Platform:* describes the Livescribe Platform, the Pulse smartpen and Livescribe dot paper, and Pulse smartpen applications.
- *README.txt:* provides a quick overview of how to set up your development environment. It is aimed at experienced developers and presents information with minimal context. For full instructions, see *Getting Started with the Livescribe Platform SDK* instead.

- *(This Document) Getting Started with Livescribe Platform SDK*.
- *Eclipse Help:* basic coverage of the Livescribe IDE plug-in with Eclipse.
- *Release Notes:* covers late-breaking information, fixed bugs, and known issues.
- *Glossary:* terms and definitions (located in *Getting Started with the Livescribe Platform SDK*).

Penlet Development Documentation:

- *Developing Penlets*: the primary programming guide for open paper (OP) and fixed print (FP) penlet development.
- *Livescribe Platform API javadoc*: API reference for packages, classes, and methods.
- *User Experience Guidelines:* presents user interface guidelines for creating penlets to ensure a consistent user experience across all smartpen applications.
- *Development Guidelines:* presents guidelines for creating penlets and paper products that conform to Livescribe standards and legal requirements.

Paper Product Development Documentation:

- *Developing Paper Products:* introduces the Livescribe Paper Designer and processes for designing paper products for the Pulse smartpen.

End-User Documentation

To learn about the Pulse Smartpen and Livescribe Desktop from a user's perspective, please consult their user guides. They are available at http://www.livescribe.com. Click on the Support button and locate the Documents list in the right-hand column. Links to the following documents in PDF format are available:

- *Getting Started*: introduces the Pulse Smartpen. A dot-enabled version of this document is included in the Pulse Smartpen box.
- *Pulse Smartpen User Manual*: explains Pulse Smartpen features and use.
- *Livescribe Desktop User Manuals for Mac OS X and Windows*: explain Livescribe Desktop features and use.

Introduction

This section describes the development platforms supported by the Livescribe Platform SDK, as well as some issues pertaining to developers on particular platforms. It also contains some important notes and warnings that developers should keep in mind.

Supported Development Platforms

The Livescribe Platform SDK supports the following development platforms:

- Windows XP SP2/SP3 and Windows Vista

Notes and Warnings

As you undertake your first penlet development, please keep the following notes and warnings in mind.

Do Not Distribute Livescribe Binaries

The Livescribe Platform SDK includes development tools for generating application resources, installing penlets to and uninstalling penlets from the smartpen. You may freely use these tools while developing penlets, but the *Livescribe Developer License Agreement* prohibits you from distributing these tools to your customers.

The Livescribe online store will be the venue for sale and distribution of your penlets to smartpen users. Please post questions on specific binaries to the Livescribe Developer Forums and the Developer Team will provide answers.

Expect Continued Support of Current API

The Livescribe Platform exposes a Java API for developing smartpen applications. You can depend on the packages and classes already exposed will continue to be supported in the future. Upcoming releases of the SDK will contain new packages and classes to support additional functionality without disturbing the existing API. Any removal of APIs will follow standard Java deprecation procedures.

Contents of the SDK

The Livescribe Platform SDK includes the Livescribe Platform API, documentation, sample code, and a set of development tools. The official IDE for penlet development is Eclipse plus custom plugins for Eclipse created by Livescribe. The Livescribe API and all tools are immediately accessible from within Eclipse, once the plugins are installed.

Plugins and Features

An Eclipse *feature* is a package of one or more Eclipse plugins. Livescribe publishes Eclipse features that contain the plugins you need for developing penlets and paper products. When you see the word *feature*, remember it is a specialized term in Eclipse and refers to a group of plugins that are installed, uninstalled, and managed as a group.

Directory Structure of the SDK

The top-level of the SDK 1.0.1 contains a directory reflecting the current version number of the Platform SDK, such as **`1.0.1`**. The tree below that directory is as follows:

- **CoreUtilities**
  Directory subtree for developing penlets, using one of the Core Utilities options. Contains the Livescribe Smartpen API classes, Javadoc for the Livescribe Smartpen API, development tools, and project files for importing the Livescribe Smartpen API into Eclipse or NetBeans as a project.
  CoreUtilities is for Windows developers only.
  If you are using Eclipse with Livescribe Plugins, you can ignore the CoreUtilities directory subtree.
- **Docs**
  Directory subtree containing documentation for the SDK.
  - **DeveloperDocs**
    Documentation for third-party developers in PDF format:
    - *Getting Started with the Livescribe Platform SDK*
    - *Introduction to the Livescribe Platform*

  - *Developing Penlets*
  - *Developing Paper Products*
  - *User Experience Guidelines*
- **penprofile-apidoc**

  Javadoc for the Smartpen Java API. To launch the Javadoc outside of the Eclipse IDE, click on `index.html` .
- **License**

  The Livescribe license agreement for third-party developers, in TXT and PDF formats. All developers must accept this agreement before downloading the Platform SDK.
  - *Livescribe Developer License Agreement*

- **EclipsePlugins**

  Zip archive that contains Livescribe's custom Eclipse features. Each feature consists of Eclipse plugins created by Livescribe to provide specialized functionality for penlet development.
- **EclipseFullInstall**

  Zip archive that contains a full distribution of Eclipse with Livescribe's custom Eclipse features already installed.
- **Resource**

  In the **audio** subdirectory, you will find WAV files for the sounds that Livescribe uses in its own penlets. To ensure consistency across all applications on the smartpen, third-party developers should include these audio files in their penlet projects, as needed.
- **Samples**

  Sample projects for simple Hello World penlets and a sample paper project. For more samples, go to http://www.livescribe.com. In the Developer Forums, find ***Sample Code & Docs & FAQs***.
- *README.txt*

  This file provides a quick overview of how to set up your development environment. Aimed at experienced developers, it briefly describes set up for the three development environment options described above. For more detailed instructions, see *Getting Started with the Livescribe Platform SDK*.

Setting Up Your IDE

The basic environment for developing penlets and paper products consists of

- Eclipse
- Eclipse plugins from Livescribe
- the JDK (Java Development Kit)
- and a postscript rasterizer, such as Ghostscript.

In addition, to create background images for your paper product, you will need a graphics authoring tool that produces EPS files. Two excellent choices are Adobe's Illustrator and the open source program Inkscape.

Hardware and Software Requirements

Penlet and paper product development requires the following hardware and software:

- The Windows operating system (Windows XP, Windows Vista).
- A USB connection to a Livescribe Pulse Pen
- The Pulse Pen driver and smartpen communication software. (Installing Livescribe Desktop automatically installs these for you.)
- Eclipse v3.4 (Ganymede) or higher.
- The Java Development Kit (v1.6 or higher; also known as JDK 6)
- Ghostscript

Two Options for Installing Livescribe Features

The Livescribe Platform SDK supports installation of our Eclipse features (which are packages of plugins) in two ways. You may choose the one that suits your development needs.

Installing Eclipse and Livescribe Features Together

Option 1: If you do not have Eclipse 3.4 installed on your computer already, you can choose to quickly install Eclipse and Livescribe's Eclipse features. The Livescribe Platform SDK includes a zip file with the full distribution of Eclipse and the Eclipse features. You merely decompress the zip archive on your file system and you are ready to start developing for the Livescribe Platform.

Adding Livescribe Features to Existing Eclipse

Option 2: On the other hand, you may already be using Eclipse 3.4 for other kinds of Java development. If so, you can add the capability to develop Livescribe penlets and paper products to your existing Eclipse distribution. The Livescribe Platform SDK includes a zip file that contains just Livescribe's Eclipse features. In Eclipse terms, this zip file is an *update site*. Start your existing Eclipse and use the Update Manager to install Livescribe's Eclipse features.

Installation Instructions

Setting up the IDE for Livescribe penlet and paper development consists of these steps:

1. Updating Livescribe Desktop (Windows) to version 1.6 and updating pen software to version 1.6.
2. Copying the Livescribe Platform SDK to your file system.
3. Installing the JDK.
4. Installing Ghostscript.
5. OPTION 1: Installing Eclipse and Livescribe's Eclipse Features.

   OR

   OPTION 2: Adding Livescribe's Eclipse features to an existing Eclipse.

Updating Livescribe Desktop

Your Livescribe Desktop application must be up to date. You should install all available updates. That way, you can be sure to have the latest USB drivers required by the smartpen *and* that your smartpen firmware image is also up to date.

1. Install Livescribe Desktop from www.livescribe.com. On the web site, click **Support > Getting Started > Livescribe DesktopXP/Vista(32bit)**.
2. Launch Livescribe Desktop and select **Help > Check for Updates** .
3. If your smartpen or desktop software is not up to date, an online wizard will offer to download and install available updates. You should accept each update until the wizard indicates that your smartpen and desktop software are up to date.

Copying the Livescribe Platform SDK

Copying the Livescribe Platform SDK to your file system consists of downloading the SDK zip file from the Livescribe web site and then unzipping it on your computer.

1. Go to http://www.livescribe.com/developer.
2. If you have not done so already, make sure to register as a Livescribe Developer by clicking the Register button in the lower left-hand panel. Once you have registered, click the Login button in the upper right and enter your e-mail address and password.
4. The first time you log on as a developer, you'll see a **Download** link. Click the link and read the Livescribe Developer License Agreement. Click the button entitled **I Agree** at the bottom the page and then click the SDK link on the page that follows.

   Note: During subsequent logons with your developer account, you will be taken directly to the developer welcome page. In the right-hand column, click on Downloads. Then click on the SDK link.
5. Save the download to your computer. It is a zip archive.
6. Unzip the archive to a directory on your computer file system. The top-level directory of the unzipped archive reflects the current version number of the Livescribe Platform SDK.
7. Note the location of the Livescribe Platform SDK. You will need it when you install the Livescribe plugins.

Installing the JDK

1. Install JDK 6 or above.

   The latest version is called the Java SE Development Kit.

2. Go to http://www.java.sun.com
3. Click the **Java SE** link and then the **Downloads** tab.
4. Download **Java SE Development Kit (JDK) 6 Update X** (where X is the latest update number).

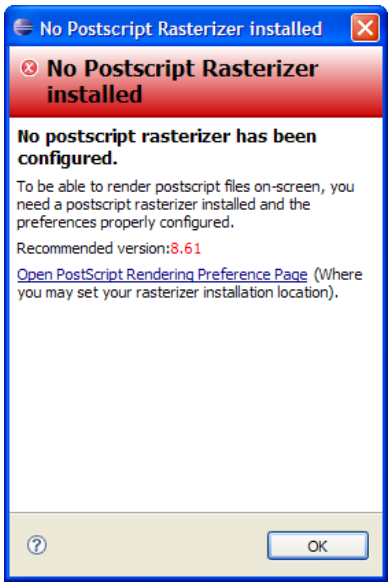
   Note: You must install the Java Development Kit (JDK). The Java Runtime (JRE) alone will not suffice.

5. Verify that the JAVA_HOME system environment variable is set to the path of the JDK. For example: C:\Program Files\Java\jdk1.6.0_06.

Installing Ghostscript

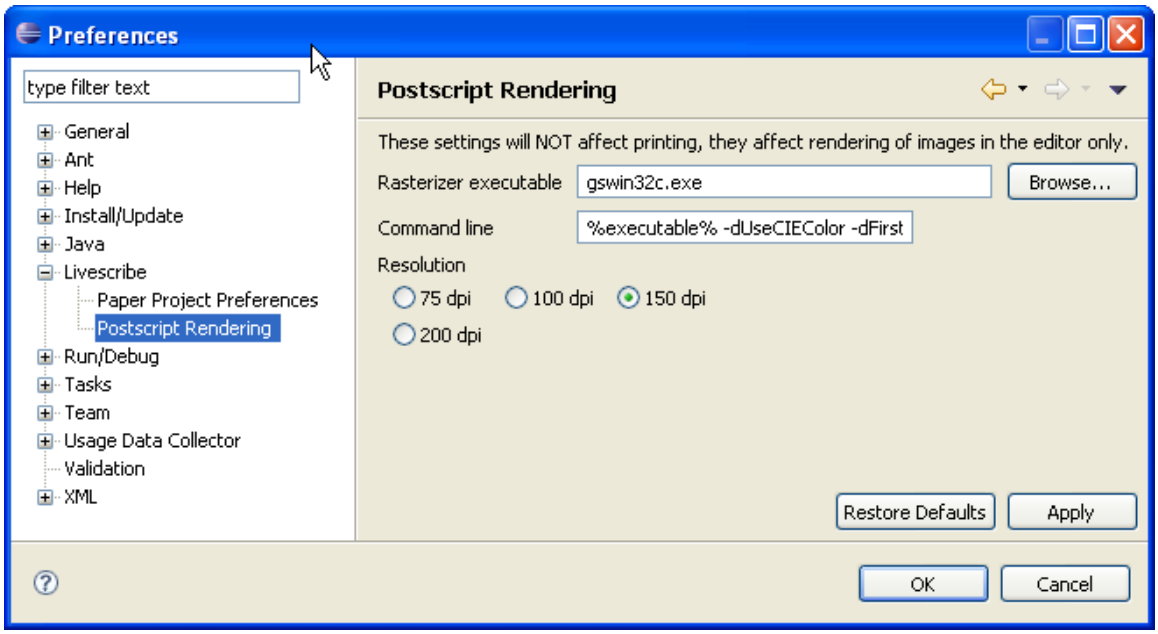
Ghostscript is an open source project that includes a RIP (Raster Image Processing) engine that can be used as a Postscript and PDF viewer. You will need Ghostscript, or a similar program, in order to render images onscreen in the Paper Design perspective. Ghostcript is available as a free download. Go to http://www.ghostscript.com for a list of download sites.

If you do not have Ghostscript installed, you will see the following error message when you try to use the canvas:


No Postscript Rasterizer installed
No Postscript Rasterizer installed
No postscript rasterizer has been configured.
To be able to render postscript files on-screen, you need a postscript rasterizer installed and the preferences properly configured.
Recommended version:8.61
Open PostScript Rendering Preference Page (Where you may set your rasterizer installation location).
OK

To configure the Paper Designer to work with Ghostscript:

1. Install Ghostscript by copying the distribution files to a convenient location on your file system.
2. In Eclipse, go to
   Window >Preferences >Livescribe >Postscript Rendering



3. In the Preferences dialog, specify values that the Paper Designer should use to launch the Ghostscript executable. For instance, if you are running Windows, you values might be similar to these:
   - **Rasterizer executable**: `C:\Program Files\gs\gs8.64\bin\gswin32c.exe`
   - **Command line**: `%executable% -dUseCIEColor –dFirst`
   - **Resolution**: `150 dpi`
4. Add the Ghostscript path to the PATH environment variable (in the System Variables of the System dialog). For instance, in this case, you'd add: `C:\Program Files\gs\gs8.64\bin`

Warning: The 64-bit version of Ghostscript is not currently supported. If you are running 64-bit Windows, you must install the 32-bit version of Ghostscript. Do not forget to include the location of your 32-bit Ghostscript distribution in your PATH environment variable.

Option 1: Installing Eclipse and Livescribe's Features Together

Your first option is to install Eclipse 3.4 with the Livescribe Eclipse Features already installed. This is the simplest and fastest way to set up your Eclipse IDE for penlet and paper product development. One zip file contains a full distribution of Eclipse 3.4, including the pre-installed Livescribe Eclipse features.

1. In the Livescribe Platform SDK, go to `EclipseFullInstall\platformSDK10win32.zip`
2. Unzip the file. For instance, you might unzip it to: `C:\eclipse3.4` .

   Eclipse does not use a dedicated installer program. Simply copy the Eclipse distribution to the desired location on your file system.

   Note: Do NOT include a space in the path of your Eclipse installation. A path with spaces in it will prevent you from deploying your penlets to the smartpen from Eclipse.
3. Find the `eclipse.exe` file on your file system and launch Eclipse.

   Note: The installation process does not create an icon in the Windows Start menu. You must open Windows Explorer and navigate to the directory where you copied `eclipse.exe` .

Option 2: Adding Livescribe Features to Existing Eclipse

You second option is to add Livescribe's Eclipse features to your existing Eclipse distribution. This option assumes that you have Eclipse 3.4 (Ganymede) already installed.

If you find your Eclipse has become corrupted or is not the right version, you can download the latest Eclipse distribution for free from http://www.eclipse.org.

In Eclipse, you install features and update them, using the Update Manager.

1. Launch Eclipse. (Navigate to your `ECLIPSE_HOME` directory and launch the executable directly: the Eclipse installation does not create an icon in the Windows start menu.)
2. Select **Help >Software Updates**.
3. Then click on the **Available Software** tab.

4. Click **Add Site**.
5. Click Archive to create an update site for your Livescribe feature. The update site is called an archive because the feature is packaged as a zip file.
6. In the SDK, navigate to `1.0.1\EclipsePlugins\platformSDK10updatesite.zip`. Select the zip file and click **Open**.
7. In the Add Site dialog, click **OK**.

   On the Available Software tab, the Livescribe update site should automatically appear in the list of update sites. The top-level node will display the location of the zip file on your file system.
8. Select the check box for the Livescribe update site. Then click **Install** to start the installation wizard.
9. On the Install page of the wizard, click **Finish**

   OR

   If you have not accepted the Livescribe license, the Next button will be ungrayed. Click **Next**. On the Review Licenses page, click **I accept the terms of the license agreement**. Then click **Finish**.
10. Click **Yes** to restart Eclipse.
11. When Eclipse launches, you may have to select your workspace. Then click **OK**.
12. You should see Livescribe's Pen Debug and Pen Info views. If not, select **Window** > **Open Perspective** > **Other > Paper Design** and **Window** > **Open Perspective** > **Other** > **Penlet**. Then click **OK**.

Updating the Livescribe Features

You can keep your Livescribe Eclipse features up to date by simply installing the latest version of each feature as they become available. Feature updates are performed by Eclipse's Update Manager.

We use local, archived sites to update Livescribe's Eclipse features. With this approach, the simplest method for acquiring updates is to download the latest version of the Livescribe Platform SDK from the Livescribe web site. Then activate the Update Manager, and navigate to the new feature in the SDK and install it as a new update site. As a result, each new version of the feature will constitute its own update site.

This approach to updating does ***not*** make use of the Update Manager's Update button on the Installed Software tab. The Update button (the Install button on the Available Software tab) is appropriate for an Eclipse remote update site.

Upgrading from a Penlet SDK 0.9 Feature

You may have been using a pre-release version of the Livescribe Platform SDK, which was called the Penlet SDK at that time. To upgrade from Penlet SDK 0.9 to Livescribe Platform SDK 1.0.1, perform the following steps:

1. Remove the 0.9.1 feature as follows:
   a. Select **Help->Software Updates->Installed Software**.
   b. Highligh the feature, such as Livescribe Penlet SDK.
   c. Click **Uninstall**.
2. Quit Eclipse.
3. On your file system, navigate to the location where Eclipse is installed. Find the **plugins** directory and remove the following:
   - `com.livescribe.sdk.lib_0.9.1` (a directory)
   - `com.livescribe.sdk.help_0.9.1` (a directory)
   - `com.livescribe.sdk_0.9.1.jar`. (a file)
4. Restart Eclipse.

   At this point, your old penlet projects are broken and don't look like penlet projects in the Eclipse IDE.

If you skipped step 2 and 3 above, your penlet projects *look* fine in the Eclipse IDE, but they are actually broken in subtle ways.

5. Install the Platform SDK 1.0.1 update.
   Instructions are essentially the same as for installing For instructions, see Installing Features (Plugins) in SDK 1.0.1.

   Now the penlet projects look like penlet projects again. However, they display in the Eclipse IDE as broken projects because their library references are pointing to the 0.9.1 feature.

6. Do the following for each old penlet project:

   a. Open the build.xml file and change the first property line from:

      ```
      <property name="common.builddir" value="<your directory here>\eclipse\plugins\com.livescribe.sdk.lib_0.9.1" />
      ```

      to:

      ```
      <property file="build.properties" />
      ```

   b. Right-click the project's top node in Project Explorer.
      Select **Create Distribution**.

      The `build.xml` file should now be free from errors.

      To verify visually: close the `build.xml` file, refresh the project, and reopen the build.xml file..

   c. Now you should fix the build path.
      Right-click the project's top node in Project Explorer.
      Select **Build Path -> Configure Build Path** from the context menu.

   d. In the build path editor, select the **Libraries** tab.

      There should be 3 libraries: `j2me.jar`, `java-main.jar`, `livescribe.jar` .

   e. Select the libraries and remove them.

   f. On your file system, find the `.classpath` file. It is located at the root directory of the project. Open the file in a text editor.

   g. Find the line that looks like this:
      `<classpathentry kind="src" path="src"/>`
      After it, add this line:
      `<classpathentry kind="con" path="PENLET_CONTAINER/libraries"/>`

h. Right-click the project's top node in Package Explorer.
   Select **Refresh** from the context menu.

Your project is converted to Platform SDK 1.0.1!

Deprecation Errors

You may see deprecation errors in the source code. Some reasons might include:

- The `AreaEnterExitListener` interface was changed to `RegionEnterExitListener`.
- The PenTipListener interface has a method whose name has changed from `removePentipListener` to `removePenTipListener`.

Please refer to the Javadoc of the Livescribe API for further information on specific API changes.

Installing Features (Plugins) in SDK 1.0.1

1. Launch Eclipse and select **Help > Software Updates**.
2. Click on the **Available Software** tab.
3. Click on **Add Site**.
4. Click on **Archive**.
5. In the SDK, navigate to `EclipsePlugins\platformSDK10updatesite.zip` . Select the zip file and click **Open**.
6. In the Add Site dialog, click **OK**.

   On the Available Software tab, a new Livescribe update site should automatically appear in the list of updates sites. The top-level node will display the location of the zip file on your file system.
7. Select the check box for the new Livescribe Platform SDK feature. Then click **Install** to start the installation wizard.
8. The Install page of the wizard should say that since the feature is already installed, an update will be performed instead. Click **Finish**.
9. Click **Yes** to restart Eclipse.
10. When Eclipse launches, you may have to select your workspace. Then click **OK**.

11. Livescribe's Penlet perspective should be showing. If not, select **Window > Open Perspective > Penlet**. Then click **OK**.

Introducing the Eclipse Features

Livescribe's plugins for Eclipse are packaged as two Eclipse features:

- the Penlet feature
- the Paper Design feature

Each feature is designed for a particular kind of project. The Penlet feature allows you to create a penlet project. The Paper Design feature (also called the Paper Designer) allows you to create a paper project.

Livescribe Projects in Eclipse

In Eclipse, a *workspace* manages one or more *projects*. A project is typically a directory structure containing many files that make up an application.

A Livescribe *paper project* is used to store files associated with the design and creation of Livescribe dot paper. A Livescribe *penlet project* is used to store code and resources that are compiled into a penlet.

The paper you create typically has a dedicated Java penlet associated with it that interacts with pre-defined active regions on the paper. Each paper project contains one principle file called an AFD, as well as some auxiliary files. The AFD is a proprietary document format, similar to a zip archive, which contains files and information about a given paper product.

Livescribe Perspectives in Eclipse

Eclipse uses perspectives to help organize projects. A *perspective* is a collection of *views* (windows) and associated *actions* (toolbar buttons and menu options) that are required for a particular kind of project.

The Livescribe Eclipse features provide two perspectives: a Penlet and a Paper Design perspective. Each one contains all views and actions you need to use the feature. You display a perspective by selecting **Window > Open Perspective**, and then selecting **Paper Design** or **Penlet** from the popup menu.

NOTE: The text editor, which contains the source code of a penlet, is the same in either perspective. When you change perspectives, the text editor will continue to display the same source files.

Penlet Perspective

The Penlet feature contains these capabilities:

- ***Livescribe Penlet Project Creation Wizard*** - The project wizard simplifies the process of creating penlet projects.
- ***Views*** - two views, Smartpen Info and Smartpen Debug, that provide information about the state of the connected pen.
  NOTE: The views window may be so narrow that the full title is not visible (such as **Smar** instead of **Smartpen Debug**). Expand a view by clicking and dragging the left border.
- ***Actions*** - Toolbar buttons and menu options allow you to deploy penlets to a pen.
- ***Dialogs*** - allow you to convert resources (images, audio files) for usage on the pen or add system sounds (*.wav) to a penlet project.
- ***Image Editor*** - a simple editor for setting pixel values in a smartpen-compatible ARW file.
- ***Package Explorer****:* a tree control that displays the projects in the workspace. The name of each project appears on the top-most level. Click the plus next to a project name and drill down to see the various files that make up the project. Although penlet and paper projects appear in this view, Package Explorer is designed to drill down into Java projects such as penlets. To drill down into paper projects, switch to the Paper Design perspective.
- ***Import Project Wizard*** - The SDK makes it possible to import penlet projects created outside of the SDK.

For detailed information on using the Penlet feature, please see the section titled "Creating Your First Penlet" in this manual.

Paper Design Perspective

The Livescribe Paper Design Perspective is optimized for working with paper projects. You will be asked to switch to this perspective when creating a new paper projects.

The views used by the Paper Design perspective are:

- **Thumbnails**: a list of page images, providing a quick way to navigate the pages of the document.
- **Package Explorer**: a tree control that displays the projects in the workspace. The name of each project appears on the top-most level. Click the plus next to a project name and drill down to see the various files that make up the project. Both penlet and paper projects will appear in this view.
- **Outline**: a list of all the graphical elements and active regions defined on the page
- **Properties**: properties of the currently selected item.

The Paper Design feature is a very powerful tool. For detailed information on using it to create paper products, please see the manual titled *Developing Paper Products* in the Livescribe Platform SDK.

Penlet JARs

Penlets are deployed to the pen in the form of Java archive (JAR) files. Each archive contains a Java class that extends the `Penlet` class, and accompanying classes and resources. The contents of a penlet JAR is similar to regular Java archives, but there are a few significant differences:

- Penlet classes are based on the Java Platform, Micro Edition (J2ME), specifically the Connection-Limited Device Configuration (CLDC). This means penlet classes can't access all of the libraries supplied with standard Java.
- Like all J2ME CLDC classes, classes in a penlet JAR must be preverified. The off-pen preverification step checks the classes for safety and security, and thereby reduces the processing performed by the smartpen's KVM (Kernel-based Virtual Machine).
- Penlet JARs contain resources such as audio or image files that can be played or displayed on the pen. These resources will be discussed in a later section.
- The JAR that Eclipse builds for a project can be found in the project's `dist/lib` folder in the Project Explorer.

Creating a Very Simple Penlet

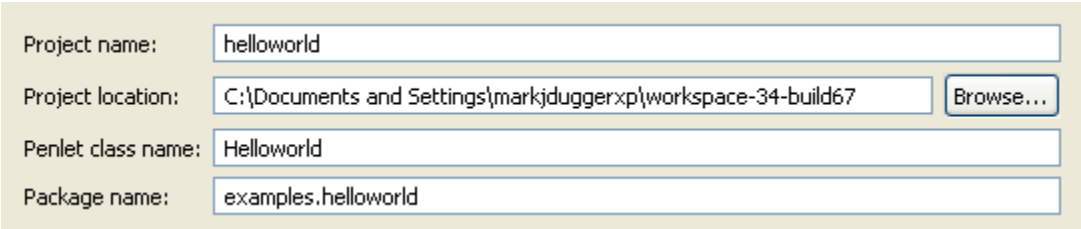
This section walks through the creation of a very simple penlet, called HelloWorld. This penlet will appear as one of the available penlets on your smartpen's main menu. When launched, it will display the text 'Hello World' and play an audio file that says 'Hello World'. To launch the penlet, you need a Nav Plus. No other paper is required.

The numbered steps below are actions you take to create the sample. We will use the Livescribe Penlet Project Creation Wizard to create the project. Then we will deploy (install) the penlet to your Pulse smartpen. In between steps, we will stop to explore the dialogs and wizards of Livescribe's Penlet feature and examine some of the source code generated by the wizard.

1. Select **Window > Open Perspective > Penlet**. The Penlet perspective should appear, with the views and toolbars you need already displayed.
2. Select **File > New > Project...** and open the **Livescribe** entry in the New project dialog. Select **Livescribe Penlet Project** and click **Next**.

The project wizard constructs a complete file hierarchy for the penlet, including directories for source files, class files, and resources. It creates an Ant script and adds libraries required for penlet development.

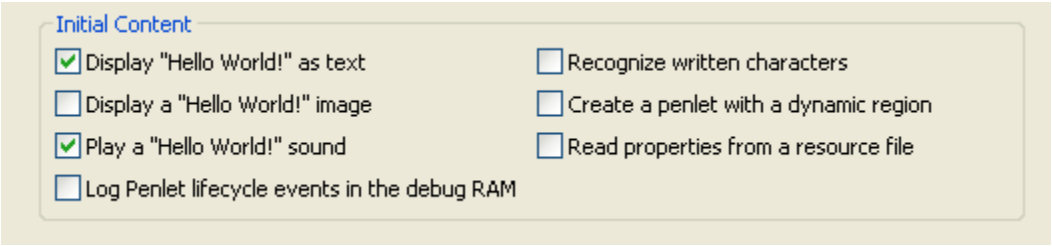
The first page of the wizard is the Project Creation Page. It is divided into two sections. The first section asks for the project name, the project's directory location, the penlet class name, and the package name.



All four fields are required. The usual rules apply to Java class and package names: no reserved words and no unusual punctuation.

The bottom half of the Penlet Project Creation Page allows you to initialize the source file in your penlet project. Several different project templates are available. Each one will cause the appropriate source code and resources to be included in your new project.

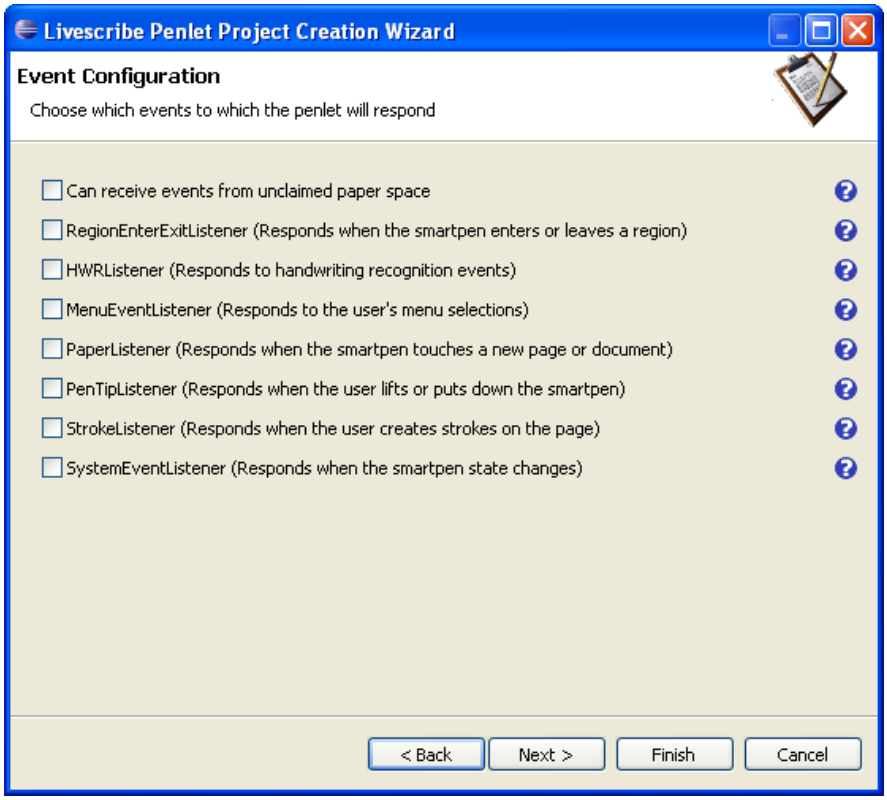
You can create several projects, selecting different options each time. In this way, you will quickly become familiar with the UI of the Penlet feature and the source code required for common smartpen functionality.


Initial Content
Display "Hello World!" as text
Display a "Hello World!" image
Play a "Hello World!" sound
Log Penlet lifecycle events in the debug RAM
Recognize written characters
Create a penlet with a dynamic region
Read properties from a resource file

3. In the Penlet Project Creation Page, enter `HelloWorld` as the name of both the project and the penlet class.

   Enter `examples.helloworld` as the name of the package.
4. Choose two options in the Initial Content group:
   - Display "Hello World" as text
   - Play a "Hello World!" sound
5. Click **Next** at the bottom of the page.
6. In the Penlet Project Creation page of the wizard, click **Next**.

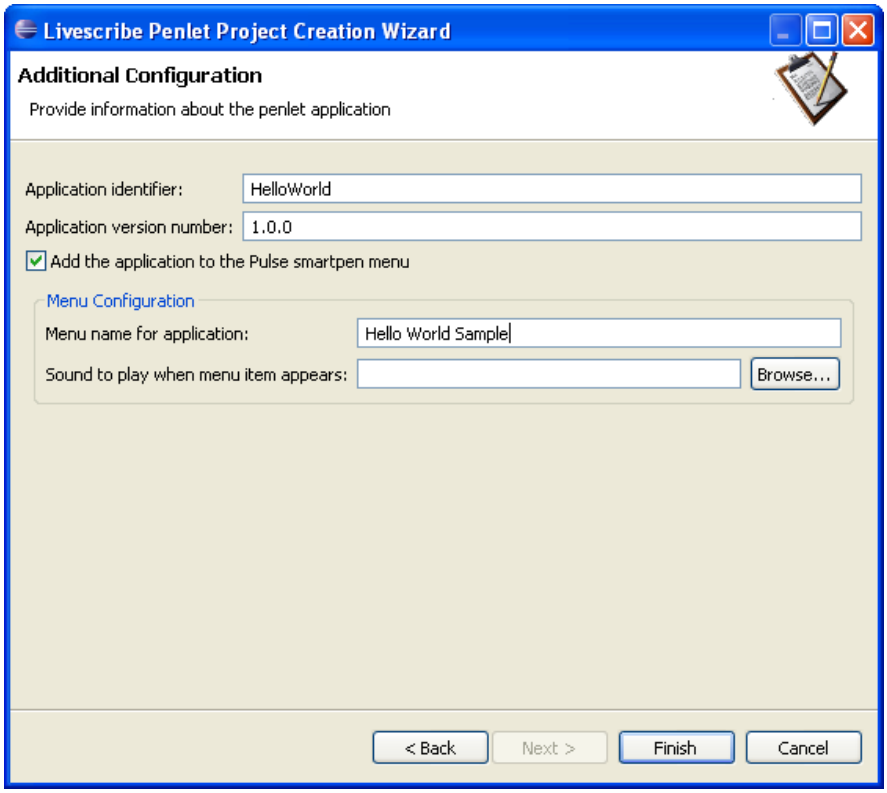
The Event Configuration page appears. On this page you can request that one or more event listeners be added to your project. An event listener is a Java interface that your penlet's primary class must implement. For each event listener you select, the code generator in the wizard creates stubs of the event handlers that make up the interface. You are responsible for providing the actual code of the event handlers.


Livescribe Penlet Project Creation Wizard
Event Configuration
Choose which events to which the penlet will respond
Can receive events from unclaimed paper space
RegionEnterExitListener (Responds when the smartpen enters or leaves a region)
HWRListener (Responds to handwriting recognition events)
MenuEventListener (Responds to the user's menu selections)
PaperListener (Responds when the smartpen touches a new page or document)
PenTipListener (Responds when the user lifts or puts down the smartpen)
StrokeListener (Responds when the user creates strokes on the page)
SystemEventListener (Responds when the smartpen state changes)
< Back
Next >
Finish
Cancel

In this walkthrough, we will not make any selections on this page. The selections we made on the Penlet Project Creation Page will add the appropriate event handlers *and* the code needed to implement them. Examining this generated code can be very instructive. You may wish to create several penlet projects, experimenting with different options on the Penlet Project Creation page of the wizard. With that experience, you will be ready to run the wizard and select options on the Event Configuration page.

7. In the Event Configuration page of the wizard, click **Next**.

The Additional Configuration page appears.



On this page you can modify:

- the name of the built penlet
- the version number of the penlet
- whether the penlet appears on the smartpen's main menu
- if it does, the name that appears in the smartpen's main menu for the penlet
- the audio file (if any) that plays when the penlet's name rolls into view in the smartpen's main menu.

The default values are as follows:

- the built penlet has the same name as the project
- penlet version is 1.0.0.
- penlet will appear as an item on the smartpen's main menu
- the penlet's name on the main menu is the same as the project name
- no audio file plays when the penlet's name rolls into view in the smartpen's main menu

Note: This audio file is played only when the user is scrolling through the smartpen's main menu. When the penlet's name rolls into view in the OLED, the sound plays. It replaces the generic menu-rolling sound.

In our Very Simple Penlet sample, however, we have a `HelloWorld.wav` sound that plays when the penlet is *launched*.. To launch a penlet, the user selects the penlet's name when it appears in the main menu.

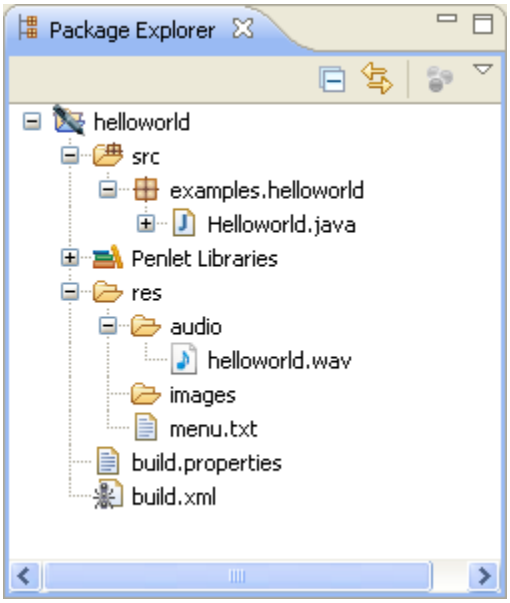
8. On the Additional Configuration page of the wizard, do the following:
    a. Make sure that the Add the application to the Pulse smartpen menu checkbox is selected.
    b. In the Menu name for application field, change `HelloWorld` to `Hello World Sample` (which is a friendlier name to display on the smartpen's main menu).

The wizard writes this information to `menu.txt`, and places the file in the project's `res` directory.

9. On the Additional Configuration page of the wizard, Click **Finish** and wait for the wizard to complete your project. This can take a few seconds.

The Livescribe Penlet Project Creation wizard creates a `HelloWorld` penlet project with resources and source code that matches the selections you made. The Penlet perspective should be active, with all the views and actions necessary to code and deploy a penlet.

The wizard has made the following changes: First, the text editor now displays the source code in the `HelloWorld.java` source file. Second, a new project appears in the Eclipse Package Explorer called `HelloWorld`. If you open its folders, you'll see a structure similar to the following:



If you examine the code in `HelloWorld.java`, you'll see that the following code has been inserted into `activateApp()`:

```
if ( reason == Penlet.ACTIVATED_BY_MENU ) {
            this.label.draw("Hello world!", true);
            this.display.setCurrent(this.label);

            this.player.play("/audio/helloworld.wav");
}
```

This first line checks whether the penlet has been activated through menu selection.

If so, the second and third line tell the smartpen to display "Hello World" on the OLED. The fourth line tells the smartpen to play the `helloworld.wav` audio file. In the Project Explorer, drill down in the HelloWorld project by clicking the plus icon next to a folder. The audio file should appear in the `HelloWorld/res/audio` directory.

Now that you've created your `HelloWorld` penlet project, it's time to package it and install it on the pen.

10. Dock your smartpen in its cradle and plug the USB connector in to your computer.
11. Click the Smartpen Info tab, if necessary, to display the Smartpen Info view. Click on the **Read Smartpen** button.

    A progress dialog should appear that says: Collecting smartpen information.

Identifying information about your smartpen should appear in the table below **Connected Smartpens**. The **Mode** value should be Normal. You will probably also see data in the Installed Penlets and Installed Documents tables.

12. If your have more than one smartpen connected, make sure the checkbox of the correct smartpen is selected in the **Connected Smartpens** table.
13. In the Project Explorer, right-click on the project name, which is the top-most node in each project. In our case, it is the text **HelloWorld** with the penlet project icon in front of it:

14. Select **Deploy Penlet** from the popup menu.

    IMPORTANT: Wait until all progress messages in Eclipse and on the smartpen itself have disappeared. Your smartpen should be displaying the date and time before you proceed.

Your project is preverified, packaged into a JAR, and deployed to your smartpen.

You should check that the deployment was successful. First, consult the Smartpen Info view in Eclipse to see if your HelloWorld sample appears in the Installed Penlets table.

15. In the **Installed Penlets** table of the Smartpen Info view, find your penlet. You may need to scroll.
16. On your Pulse smartpen, try actually running the HelloWorld penlet.
    a. Remove the Pulse pen from its cradle
    b. Tap down on the directional arrow of any Nav Plus and scroll through the smartpen's main menu until you reach the My Apps item.
    c. Tap right.

       You are now in a submenu that contains the names of all penlets that you installed on the smartpen.
    d. Tap left to scroll through your applications. (There may be only one.)
    e. Tap right to activate your HelloWorld penlet.

This activation plays the `helloworld.wav` audio file which welcomes you with "Hello, world!"

Creating an Open Paper Penlet

Now let's create a different simple penlet, called HelloOpenPaper. We assume that you have already created the previous sample, HelloWorld, and are familiar with the basics of the Livescribe Penlet Project Creation Wizard. If not, please go to Creating a Very Simple Penlet now.

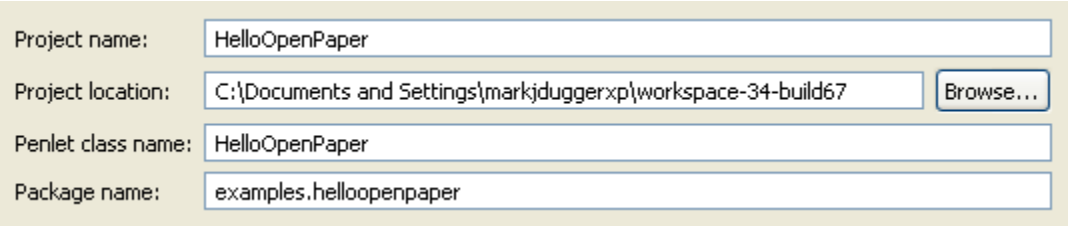
The HelloOpenPaper penlet will appear as one of the available penlets on your smartpen's main menu. When launched, it will display the text 'Draw a shape' on the smartpen OLED. The user draws a polygon of some kind. In response, the penlet will create a dynamic region with that shape and display the text 'Box height: YY, Box width: ZZ' on the smartpen's OLED.

The numbered steps below are actions you take to create the sample. We will use the Livescribe Penlet Project Creation Wizard to create the project. Then we will deploy (install) the penlet to your Pulse smartpen.

1. Select **Window > Open Perspective > Penlet**. The Penlet perspective should appear, with the views and toolbars you need already displayed.
2. Select **File > New > Project...** and open the **Livescribe** entry in the New project dialog. Select **Livescribe Penlet Project** and click **Next**.

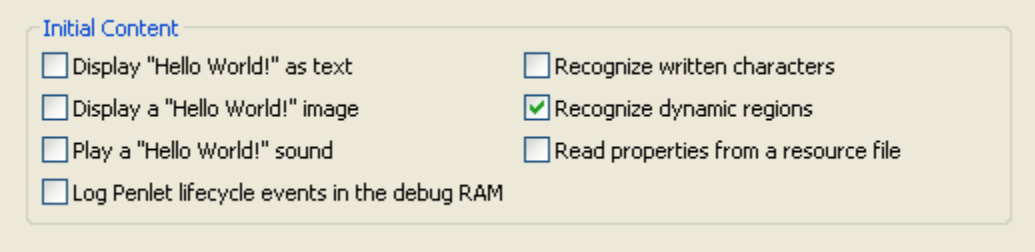
The Livescribe Penlet Project Creation Wizard starts. It constructs a complete file hierarchy for the penlet, Ant scripts, and libraries required for penlet development.

The Project Creation Page is divided into two sections. The top section asks for the project name, the project's directory location, the penlet class name, and the package name.



All four fields are required. The usual rules apply to Java class and package names: no reserved words and no unusual punctuation.

The bottom half of the Project Creation Page allows you to initialize the source file in your penlet project. We want a penlet that can recognize dynamic regions drawn by the user on Open Paper.

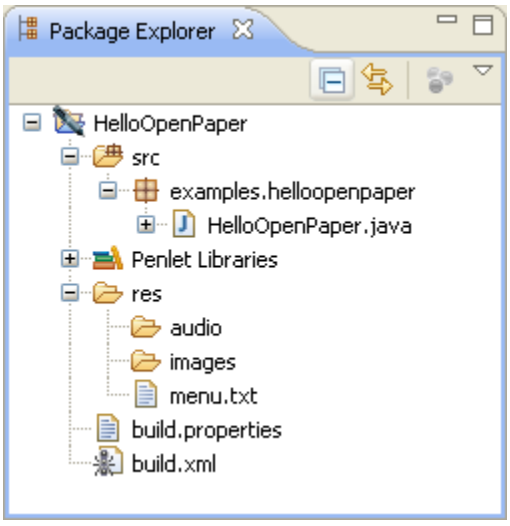

Initial Content
Display "Hello World!" as text
Display a "Hello World!" image
Play a "Hello World!" sound
Log Penlet lifecycle events in the debug RAM
Recognize written characters
Recognize dynamic regions
Read properties from a resource file

3. In the Penlet Project Creation Page, enter `HelloOpenPaper` as the name of both the project and the penlet class.

   Enter `examples.helloopenpaper` as the name of the package.

4. Choose one option in the Initial Content group:
   - **Recognize dynamic regions**
5. Click **Finished** at the bottom of the page.

The Eclipse window changes in two ways. First, the text editor displays the source code in the `HelloOpenPaper.java` source file. Second, a new project appears in the Eclipse Package Explorer called `HelloOpenPaper`. If you open its folders, you'll see a structure similar to the following:



If you examine the code in `HelloOpenPaper.java`, you'll see that the automatic code generator in the wizard has inserted the following code into `activateApp()`:

```
public void activateApp(int reason Object[] args){

            this.display.setCurrent(this.label);
            this.label.draw ("Draw a shape");
            this.context.addStrokeListener(this);

}
```

This first line sets the current display on the OLED to the `label` object that was created in the `initApp()` method.. The second line displays the text 'Draw a shape' to the OLED.

Check the signature of the `HelloOpenPaper` class and you will see that this class implements the `StrokeListener` interface. The third line in the code snippet above attaches the `HelloOpenPaper` class to the penlet context.

That is enough code for the moment. After we build and deploy this sample penlet, we shall return to the source code, examining the code that recognizes dynamic regions drawn by the penlet user. For now, let's continue.

6. In the Penlet Project Creation page of the wizard, click **Next**.

The Event Configuration page appears. On this page you can request that one or more event listeners be added to your project. For each event listener you select, the wizard creates stubs of the event handlers that make up the listener interface. You must provide the actual code of these event handlers.

In this walkthrough, we will not make any selections on this page. The selections we made on the first page will add the appropriate event handlers *and* the code needed to implement them. Examining this generated code can be very instructive.

7. In the Event Configuration page of the wizard, click **Next**.

The Additional Configuration page appears.

8. On the Additional Configuration page of the wizard, do the following:
    a. Make sure that the **Add the application to the Pulse smartpen menu** checkbox is selected.

b. In the **Menu name for application** field, change `HelloOpenPaper` to `Hello Open Paper` (which is a friendlier name to have on the smartpen's main menu).

The wizard writes this information to `menu.txt`, and places the file in the project's `res` directory.

9. On the Additional Configuration page of the wizard, Click **Finish** and wait for the wizard to complete your project. This can take a few seconds.

The Livescribe Penlet Project Creation wizard creates a `HelloOpenPaper` penlet project with source code that matches the selections you made on first page. The Penlet perspective should be active, with all the views and actions necessary to code and deploy a penlet.

Now that you've created your `HelloOpenPaper` penlet project, it's time to package it and install it on the pen.

10. Dock your smartpen in its cradle and plug the USB connector in to your computer.
11. Click the Smartpen Info tab, if necessary, to display the Smartpen Info view. Click on the **Read Smartpen** button.

    A progress dialog should appear that says: Collecting smartpen information.

Identifying information about your smartpen should appear in the table below **Connected Smartpens**. The **Mode** value should be Normal. You will probably also see data in the Installed Penlets and Installed Documents tables.

12. If your have more than one smartpen connected, make sure the checkbox of the correct smartpen is selected in the **Connected Smartpens** table.
13. In the Project Explorer, right-click on the project name, which is the top-most node in each project. In our case, it is the text **HelloOpenPaper** with the penlet project icon in front of it:

14. Select **Deploy Penlet** from the popup menu.

    IMPORTANT: Wait until all progress messages in Eclipse and on the smartpen itself have disappeared. Your smartpen should be displaying the date and time before you proceed.

Your project is preverified, packaged into a JAR, and deployed to your smartpen.

You should check that the deployment was successful. First, consult the Smartpen Info view in Eclipse to see if your HelloOpenPaper sample appears in the Installed Penlets table.

15. Click the **Smartpen Info** tab, if necessary, to display the Smartpen Info view.

    Click on the **Read Smartpen** button.

    A progress dialog should appear that says: Collecting smartpen information.

16. In the **Installed Penlets** table, find your penlet. You may need to scroll. The name will be HelloOpenPaper.
17. On your Pulse smartpen, try actually running the HelloOpenPaper penlet.
    a. Remove the Pulse pen from its cradle
    b. Tap down on the directional arrow of any Nav Plus and scroll through the smartpen's main menu until you reach the My Apps item.
    c. Tap right.
    d. Tap down to scroll through the submenu, if necessary.
    e. Tap right to activate your HelloOpenPaper penlet.

This activation displays text that says "Draw a Shape." The penlet is waiting for you to draw a ***single-stroke*** shape on Open Paper.

18. Find some Open Paper, such as the blank, middle portion of a Livescribe notebook.
19. Draw a rectangle on the paper—all in ***one*** stroke. In other words, don't lift your smartpen for each side.
20. Quickly look at the OLED.

    It should display the height and width of the rectangle you just drew.

21. Draw another single-stroke polygon on the paper and look at the display on the OLED.

You have successfully created the HelloOpenPaper sample penlet!

Examining the strokeCreated Method

As promised earlier, we will now take a closer look at some of the code for the HelloOpenPaper penlet.

1. In Eclipse, find the text editor displaying the source code for `HelloOpenPaper` class.
2. Scroll down, if necessary, until you see the `strokeCreated` method.

The `strokeCreated` method is an event handler specified by the `StrokeListener` interface. Since the `HelloOpenPaper.java` class implements that interface, the Livescribe Penlet Project Creation Wizard inserted code in the `strokeCreated` method for you.

```
public void strokeCreated(long time, Region regionId, PageInstance page) {

        StrokeStorage ss = new StrokeStorage(page);
        Stroke stroke = ss.getStroke(time);

        // Create a polygon with the number of points in the stroke
        int numPoints = stroke.getNumberofVertices();
        polygon = new Polygon(numPoints);

        // Add points to the Polygon
        for (int i = 0; i < numPoints; i++) {
            polygon.setXY(i, stroke.getX(i), stroke.getY(i));
        }

        // Create a Region and add it to the document on the pen
        Region polygonRegion = new Region(regionId.getAreaId());
        RegionCollection regions = this.context.getCurrentRegionCollection();
        regions.addRegion(polygon, polygonRegion);

        // Display the bounding box of the Polygon
        Rectangle box = polygon.getBoundingBox();
        String boxString = "Box height: " + box.getHeight() + ", Box width: " +
box.getWidth();
        this.label.draw(boxString, true);
    }

    public boolean canProcessOpenPaperEvents() {
        return true;


    }
```

The code required for this sample penlet can be summarized as follows:

1. Obtain a `Stroke` object representing the stroke drawn by the user:
    a. Create a `StrokeStorage` object.

   b. Call `getStroke` method on that object to return a `Stroke` object for the stroke that the user created at the `time` passed in to this event handler.

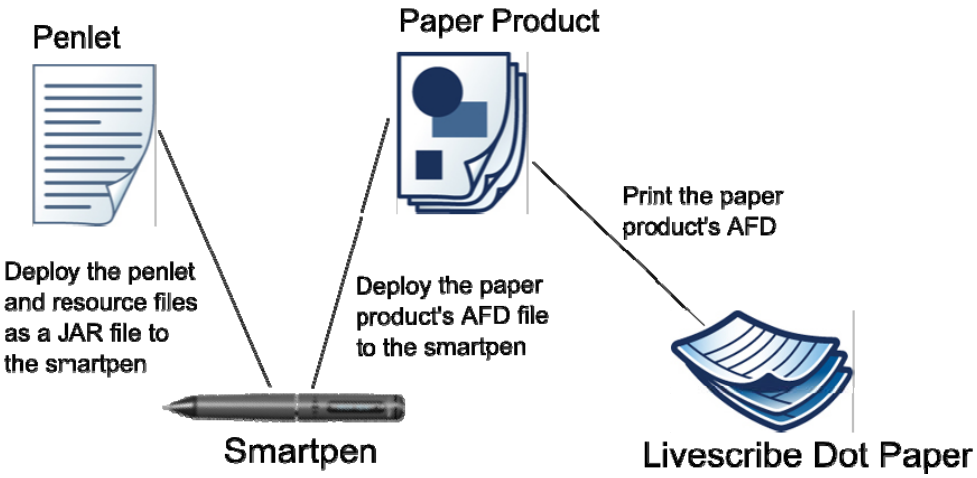
2. Create a shape from that `Stroke`:
   a. Call `getNumberofVertices` method on that `Stroke` to return the number of vertices in the shape.
   b. **Note**: For the sake of this simple example, we required that the user draw the shape in **one** stroke—without picking up the smartpen! .
   c. Ceate a new `Polygon` object with that number of vertices.
   d. Set the X and Y coordinates for each vertex of that `Polygon`, using the `Stroke`.
3. Create a Region using that shape:
   a. Create a `Region` object and add it to the current `Regions` collection. Notice that when you add the `Region`, you pass in the `Polygon` you created a few lines above.
4. Display the height and width of that shape, on the smartpen's OLED.
   a. Finally, you want to display some feedback to the user of this sample. So you call `getBoundingBox` method on the `Polygon` object. Then get the height and width of the bounding box and pass it to the `label.draw` method for display on the OLED.

The canProcessOpenPaperEvents Method

Locate the `canProcessOpenPaperEvents` method at the end of the `HelloOpenPaper.java` file. It is another event handler specified by `StrokeListener`. You ***must*** implement this method and return `true`, if you wish your penlet to be able to receive any events—such as strokes—from Open Paper.

Creating a Fixed Print Application

This section walks through the basic steps of developing a simple Fixed Print (FP) application. An FP application consists of a paper product and one or more associated (linked) penlets. . For this example, you will be creating a simple “Tap and Play” application. You will create an Active Region that a smartpen will respond to when the user taps on it. In this case, the response will be to play a “Hello World” audio file.


Penlet
Paper Product
Print the paper product's AFD
Deploy the penlet and resource files as a JAR file to the smartpen
Deploy the paper product's AFD file to the smartpen
Smartpen
Livescribe Dot Paper

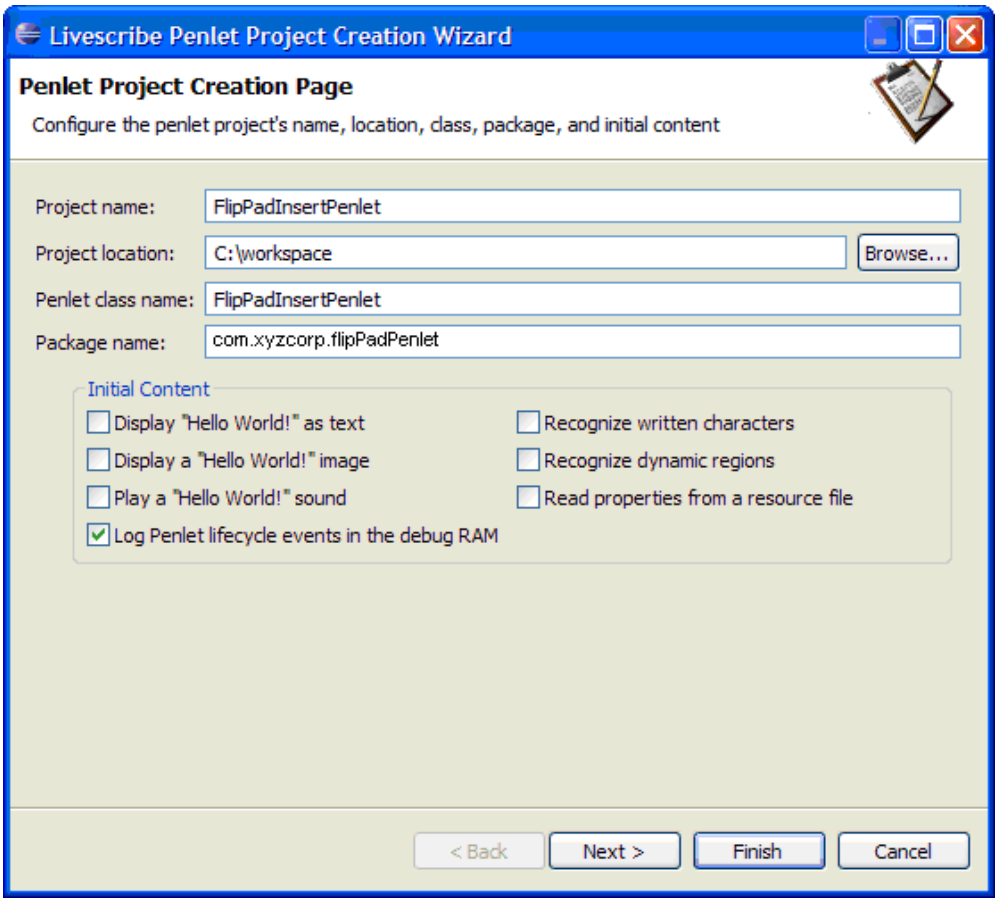
For introductory information about Livescribe paper products and penlets, refer to *Introduction to the Livescribe Platform.*

Design and Create Page Images

Generally, the first step in creating a Fixed Print application is to design the images for the paper product, including the background and other page art. For this example, however, you will use predefined artwork from Livescribe that is used for the Flip Pad insert card.

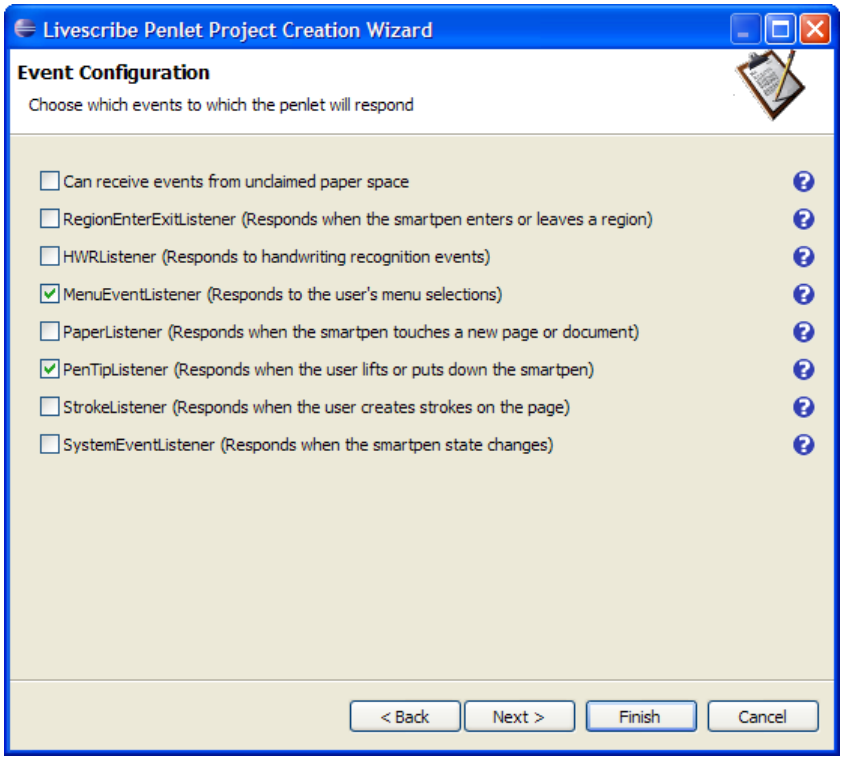
Create a Penlet Project

1. Launch Eclipse.
2. Choose **File** >**New** > **Livescribe Penlet Project**. This starts the Livescribe Penlet Project Creation Wizard, and opens up a Penlet Perspective view in the IDE.
3. Follow the wizard dialogs to create the basic penlet you want to interact with your paper product. Name the penlet **FlipPadInsertPenlet** with a package name of **com.<yourcompany>.flipPadPenlet**.
4. To help with debugging, check the **Log Penlet lifecycle events**. Leave the other checkboxes unchecked. For this application, you will not need them.



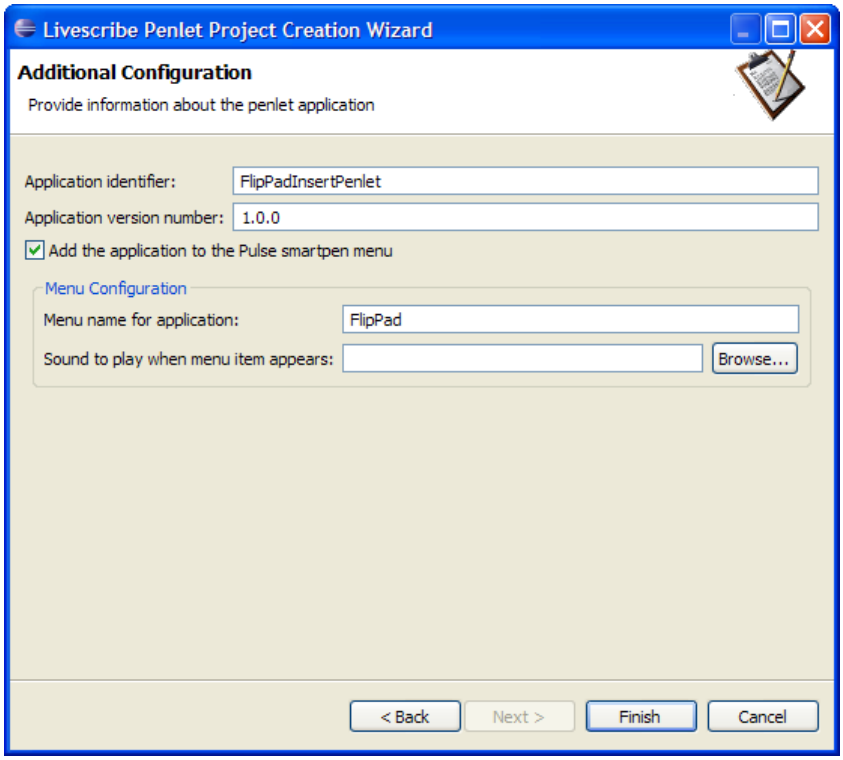
5. Click **Next**, and in the next dialog, check the smartpen events you want the penlet to respond to. The wizard will auto-generate code to respond to typical smartpen events. For this example, check the Menu Event Listener and Pen

Tip Listener checkboxes.


Livescribe Penlet Project Creation Wizard
Event Configuration
Choose which events to which the penlet will respond
Can receive events from unclaimed paper space
RegionEnterExitListener (Responds when the smartpen enters or leaves a region)
HWRListener (Responds to handwriting recognition events)
MenuEventListener (Responds to the user's menu selections)
PaperListener (Responds when the smartpen touches a new page or document)
PenTipListener (Responds when the user lifts or puts down the smartpen)
StrokeListener (Responds when the user creates strokes on the page)
SystemEventListener (Responds when the smartpen state changes)
< Back
Next >
Finish
Cancel

6. Click **Next**.
7. Provide additional configuration information, including a specific application identifier and version number. Specify a menu name for the example. Leave blank the Sound to play when the menu is invoked text box. This is not

required for this example.



8. Click **Finish**.

Create a Paper Product Project

The easiest way to create a new paper project is to use the Livescribe Paper Project Creation Wizard.

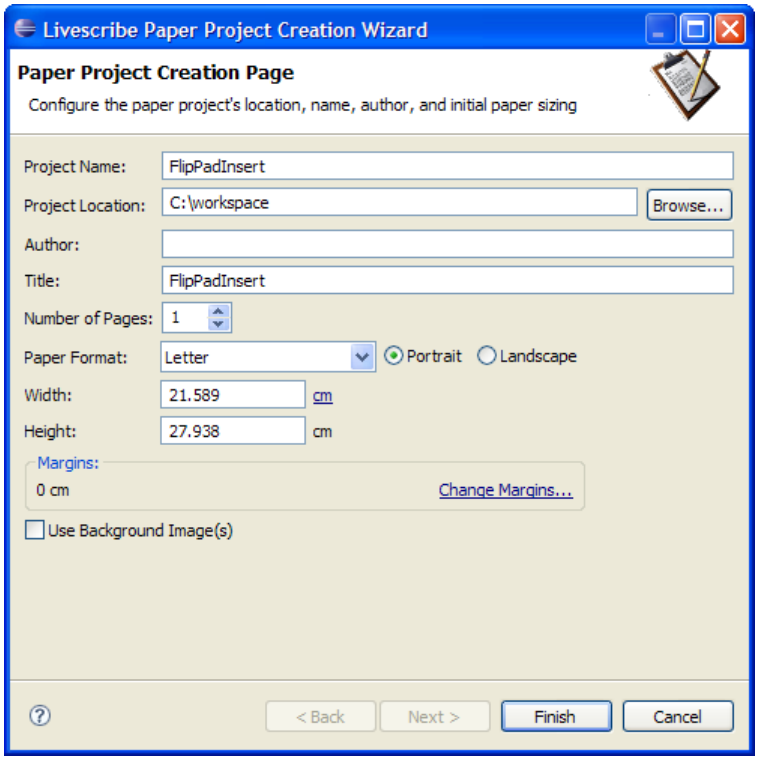
Set Up the Paper Product Project

In this example, you will import an existing file to use as your paper product, and will add a tap and play button (Active Region) to it. However, you must first create a project for the paper product.

The Livescribe Paper Project Creation Wizard sets up the project, and creates the electronic version of your paper product known as an AFD. Livescribe paper products are defined by an AFD file, which contains paper attributes, dot space, images, application linkages, and other relevant information. The wizard will create the main source version of the AFD (under the src folder) from which you can print, and a

separate AFD file (under the dist folder) that will be deployed on the smartpen. For this example, the wizard will create an AFD, but you will not be using it. Instead, you will use the pre-defined AFD from the Livescribe Flip Pad insert card.

1. Launch Eclipse.
2. Choose **File** >**New** > **Livescribe Paper Project.** This starts the Livescribe Paper Project Creation Wizard, and opens up a Paper Product Perspective view in the IDE.
3. Specify properties for the project. Enter the project name, such as **FlipPadInsert** and verify the location of your Eclipse workspace.
4. Uncheck the **Use Background Image(s)** checkbox. You will not need this for this example.
5. Leave other parameters as their defaults.



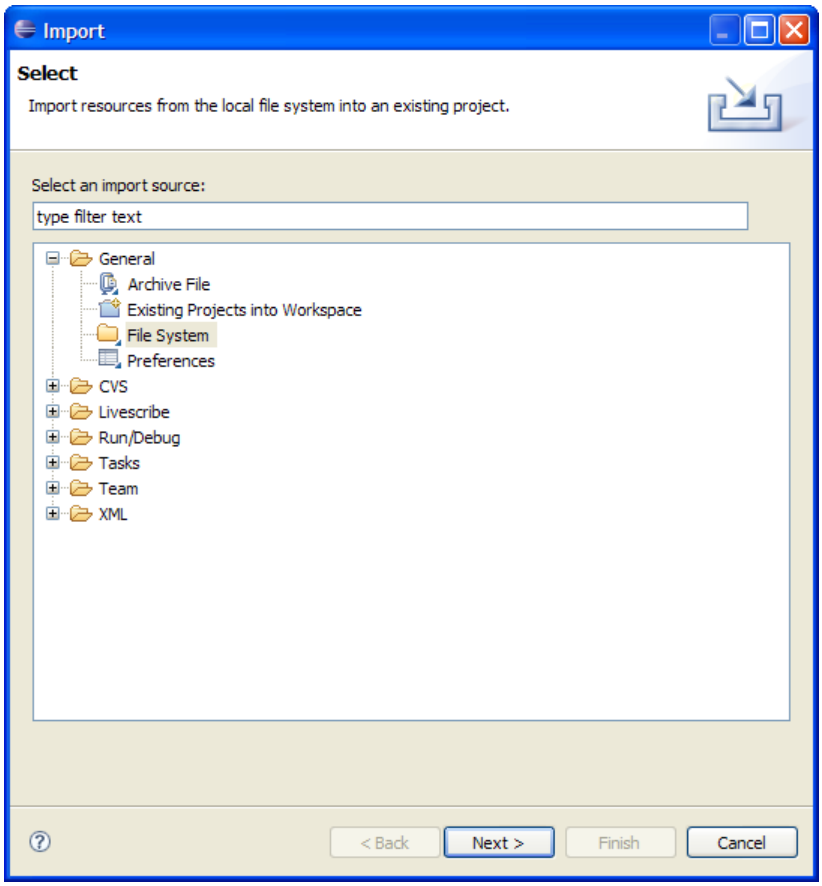
6. Click **Finish**. The wizard will then create and display your paper product and ask if you wish to open the Eclipse perspective (windows and views) for paper design. You can also manually select this perspective from **Window** > **Open Perspective** > **Paper Design**.

Design the Paper Product

After creating the paper product project with the wizard, you can then use the Paper Designer to complete your design.

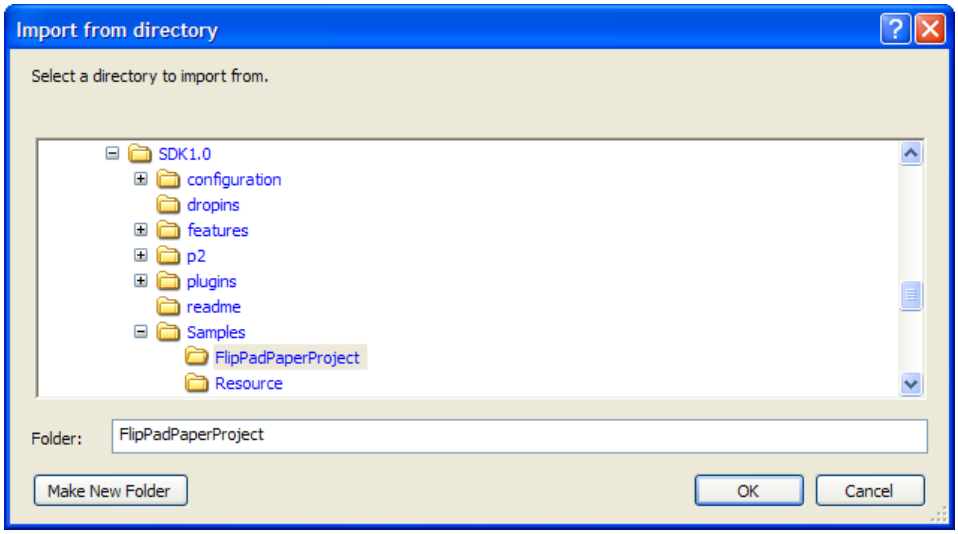
Import the Livescribe Flip Pad Insert Card AFD File

For this example, you will import the Flip Pad insert card AFD file as a starting point. Normally, however, you will use the custom paper product AFD created by the wizard in the steps above.

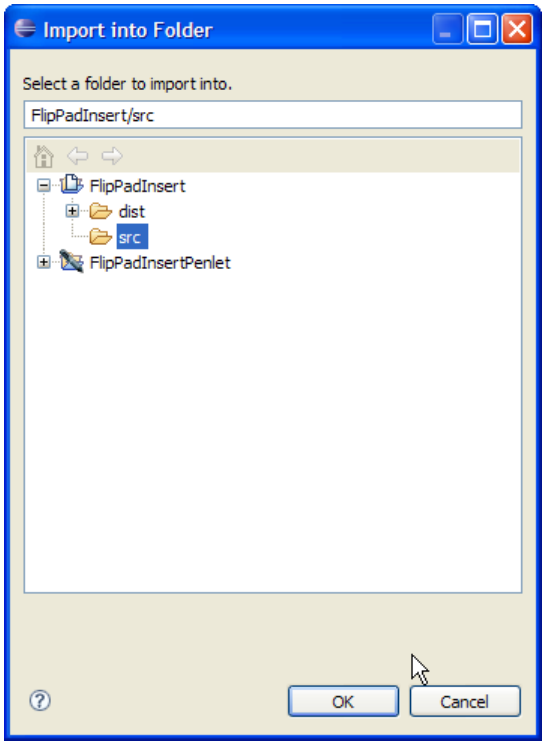
7. Choose **File** > **Import**.
8. In the Import dialog, open the **General** folder, and then choose **Filesystem**, and click **Next**.
9. 

10. In the Import File system dialog, click **Browse** next to the **From directory** text box.

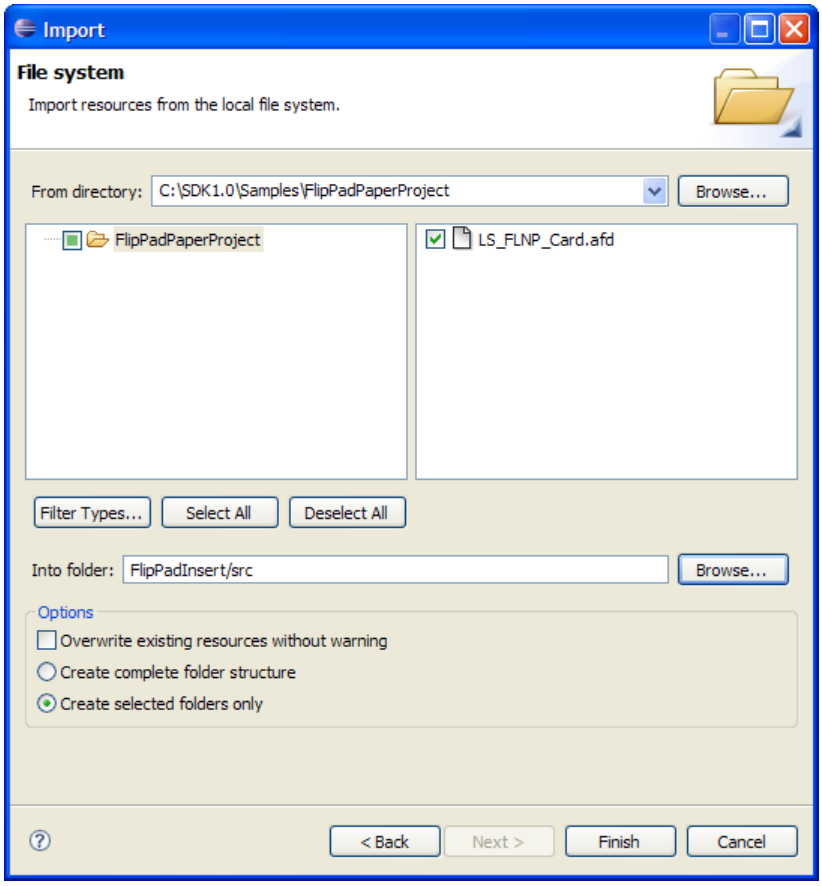
11. Navigate to the Livescribe SDK installation package and select the **\Samples\FlipPadPaperProject** folder, and click **OK** to return to the Import File system dialog.



12. In the Import File system dialog, check the **LS_FLNP_Card.afd** check box
13. Choose a destination folder. Click Browse next to the **Into folder** text box.
14. By default, the dialog will display project folders in your workspace. Select the **FlipPadInsert** paper project folder, and select the **src** folder.

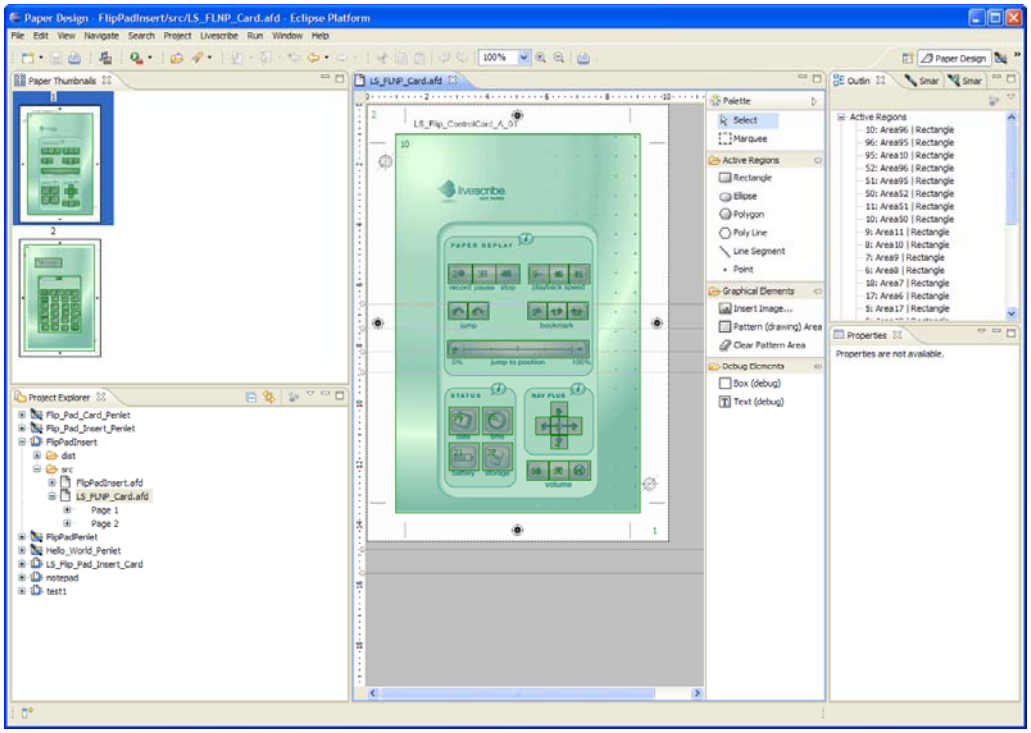


15. Click **OK** to return to the Import File system dialog.



16. Click **Finish** in the Import File system dialog to import the AFD file to your paper product project folder. The imported AFD displays in the Project explorer tree. Double-click **LS_FLNP_Card.afd** to view the AFD in the main

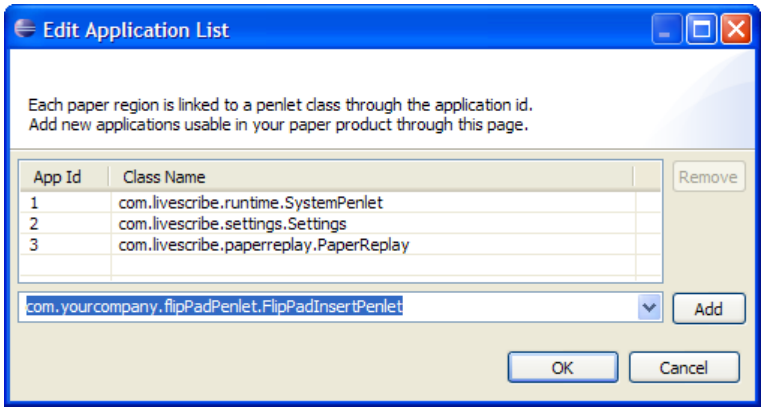
drawing area and in the thumbnail views of the Paper Designer.



Link the Paper Product to the Penlet

Associate (or link) the Flip Pad insert card AFD to the penlet you created earlier (**FlipPadInsertPenlet**). Because you are using an existing Livescribe AFD, notice that the AFD already has standard Livescribe penlets (like Paper Replay) and system penlets linked to it.

1. In Project Explorer, open the folder for your paper product.
2. Open the **src** folder.
3. Double-click the imported AFD file called **LS_FLNP_Card.afd**, not the custom AFD you created with the wizard.
4. Select **File** >**Properties**.
5. Select the **Document** tab.
6. Click **Edit Application List** to open the dialog.



7. From the drop-down list, select the application package and class name for the custom penlet you created earlier. For example: (**com.<yourcompany>.flipPadPenlet.flipPadInsertPenlet**).
8. Click **Add.**
9. Click **OK** to close the Edit Application List.
10. Click **OK** to close the Documents window.

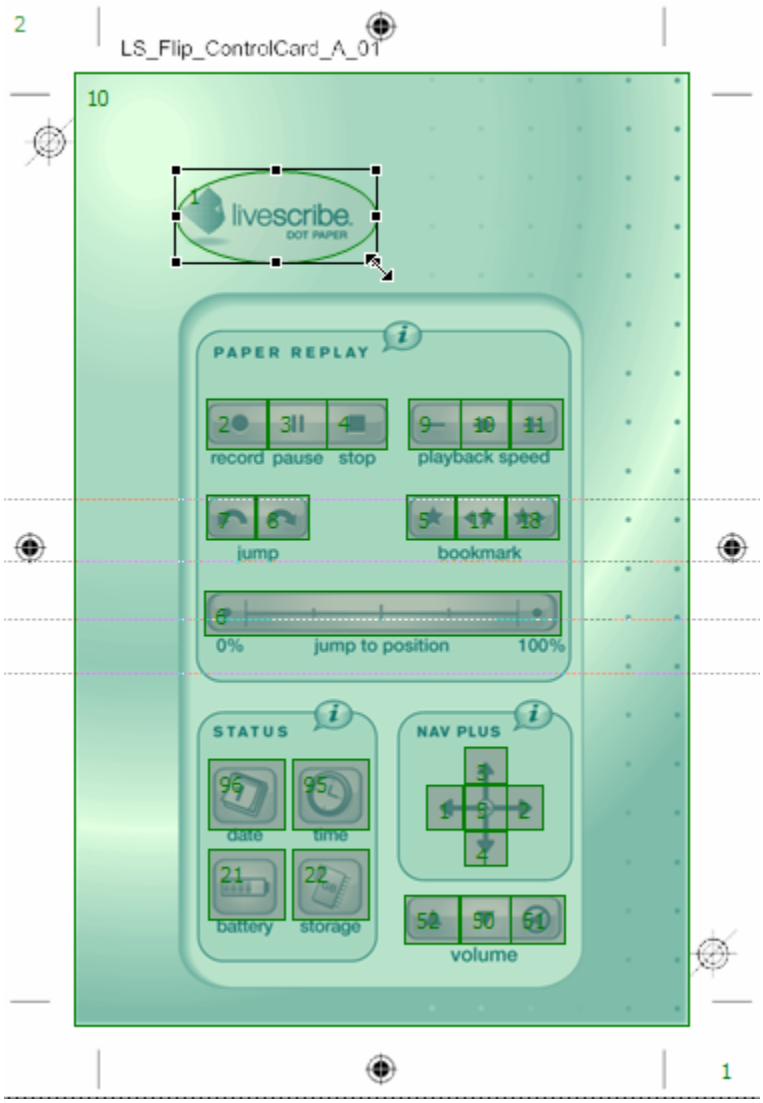
Create Active Regions (Shaping)

Use the Paper Designer graphical tools to draw active regions (controls, tap-and-play areas, and so on) that your penlet will respond to. This process is also known as *shaping*.

To create an active region on your page:

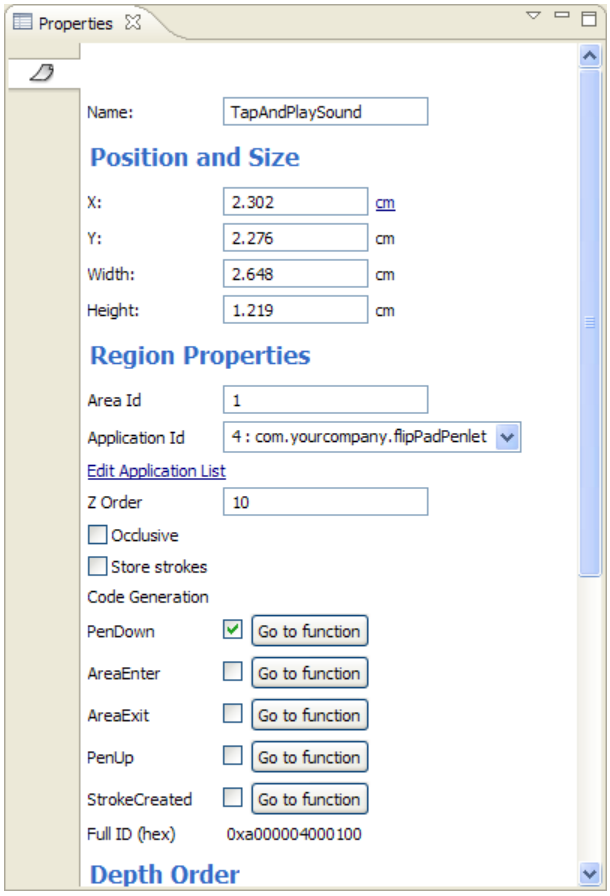
1. Select a shape (such as an ellipse) from the Active Regions folder in the palette.
2. Click in the editor canvas to place the element on your page. For this example, draw the ellipse over top of the Livescribe Dot Paper logo as shown

below.



3. Resize and move the element by clicking and dragging them in the canvas, or edit the properties in the inspector.
4. With the new region selected, use the property inspector to specify the region's name, Area Id, and the penlet that will respond to this region. The Area Id is what links specific regions on the page to the penlet. You can set it to any integer value as long as it is unique for the penlet it is linked to.
   For this example, name the region **TapAndPlaySound** and give it an Area Id of **1**.

5. In the Application Id drop down list, select your custom penlet It should be **4: com.yourcompany.flipPadPenlet**.

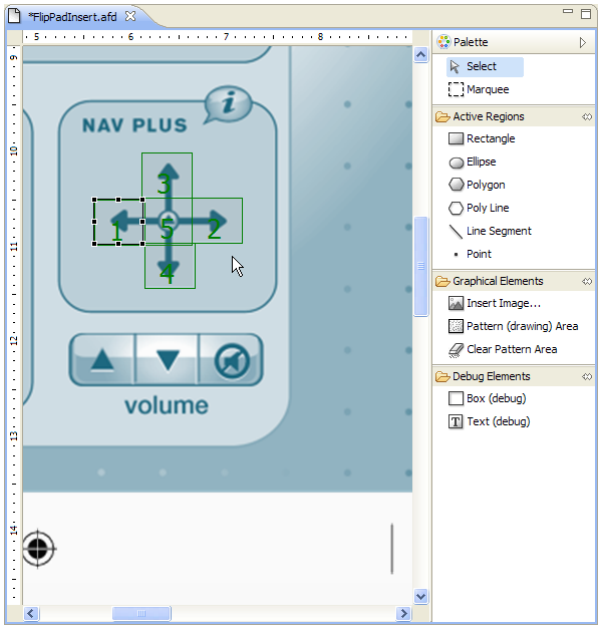


Examine the Livescribe Standard Controls

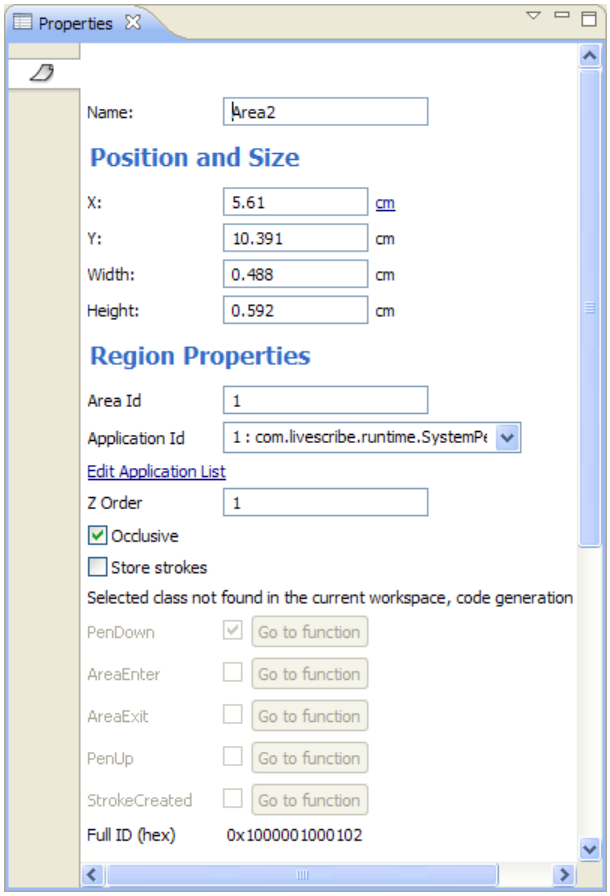
Although you will not be changing them, it is helpful to examine the pre-defined regions on the Livescribe Flip Pad Insert Card AFD.

1. Examine the Nav Plus control and notice how its Active Regions are drawn (shaped). There are five regions to shape for the center, and the left, right,

top, and bottom.



2. Also, notice the properties that have been pre-set for one of the regions. For example, the NavPlus left arrow has an Area Id of 1 and the Application Id is 1: com.livescribe.runtime.SystemPenlet.

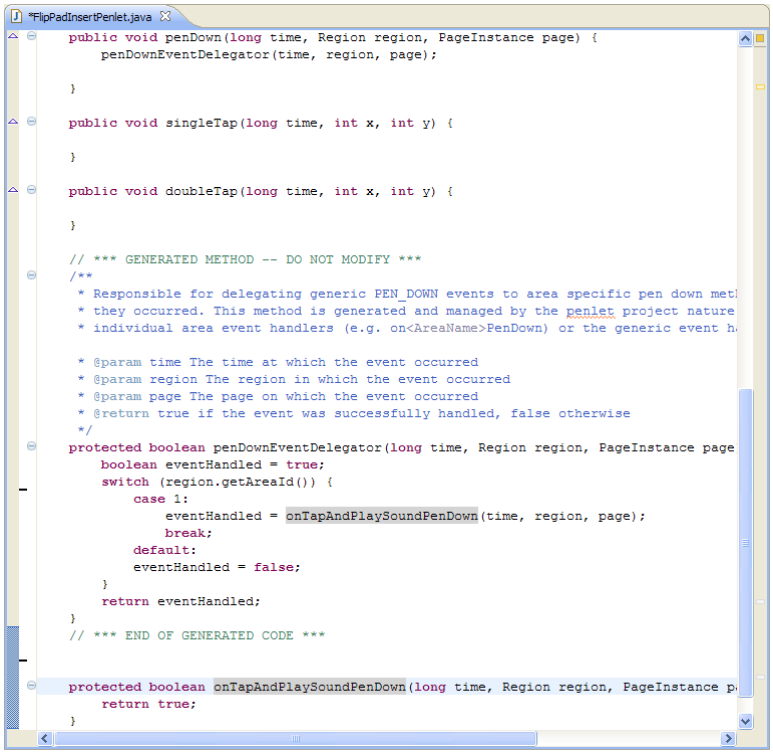


Auto-generate Event Code for Your Active Region

For each custom Active Region used by your penlet, have the Paper Designer auto-generate event code. This process saves time when programming your penlet. To trigger auto-generation of event code for an Active Region:

1. Select your custom Active Region (the **TapAndPlaySound** region).
2. In the Property Inspector, if not already selected, choose your penlet in the Application Id drop down menu. (**com.<yourcompany>.flipPadPenlet.flipPadInsertPenlet**).
3. Check the **PenDown** event. Checking this event automatically generates stub code in your penlet for this Active Region.
4. Click **Go to Function** next to PenDown to open the penlet for further editing.

In the java editor, notice that the Paper Designer automatically generated a stub penlet method called **onTapAndPlaySoundPenDown** to respond to a PenDown and other pen tip listener events on this Active Region. You can then use the Penlet editor to define what the behavior should be.


*FlipPadInsertPenlet.java
public void penDown(long time, Region region, PageInstance page) {
penDownEventDelegator(time, region, page);
}
public void singleTap(long time, int x, int y) {
}
public void doubleTap(long time, int x, int y) {
}
// *** GENERATED METHOD -- DO NOT MODIFY ***
/**
* Responsible for delegating generic PEN_DOWN events to area specific pen down met
* they occurred. This method is generated and managed by the penlet project nature
* individual area event handlers (e.g. on<AreaName>PenDown) or the generic event h
* @param time The time at which the event occurred
* @param region The region in which the event occurred
* @param page The page on which the event occurred
* @return true if the event was successfully handled, false otherwise
*/
protected boolean penDownEventDelegator(long time, Region region, PageInstance page
boolean eventHandled = true;
switch (region.getAreaId()) {
case 1:
eventHandled = onTapAndPlaySoundPenDown(time, region, page);
break;
default:
eventHandled = false;
}
return eventHandled;
}
// *** END OF GENERATED CODE ***
protected boolean onTapAndPlaySoundPenDown(long time, Region region, PageInstance p
return true;
}

Here is a code listing showing some of the auto-generated code:

```
    public void penDown(long time, Region region, PageInstance page) {
        penDownEventDelegator(time, region, page);
    }

    public void singleTap(long time, int x, int y) {
    }

    public void doubleTap(long time, int x, int y) {
    }

    // *** GENERATED METHOD -- DO NOT MODIFY ***
    /**
    protected boolean penDownEventDelegator(long time, Region region, PageInstance page)
{
        boolean eventHandled = true;
        switch (region.getAreaId()) {
            case 1:
                eventHandled = onTapAndPlaySoundPenDown(time, region, page);
                break;
            default:
            eventHandled = false;
        }
        return eventHandled;
    }
    // *** END OF GENERATED CODE ***

protected boolean onTapAndPlaySoundPenDown(long time, Region region,
        PageInstance page) {
        return true;
    }
}
```

Complete the Penlet Programming

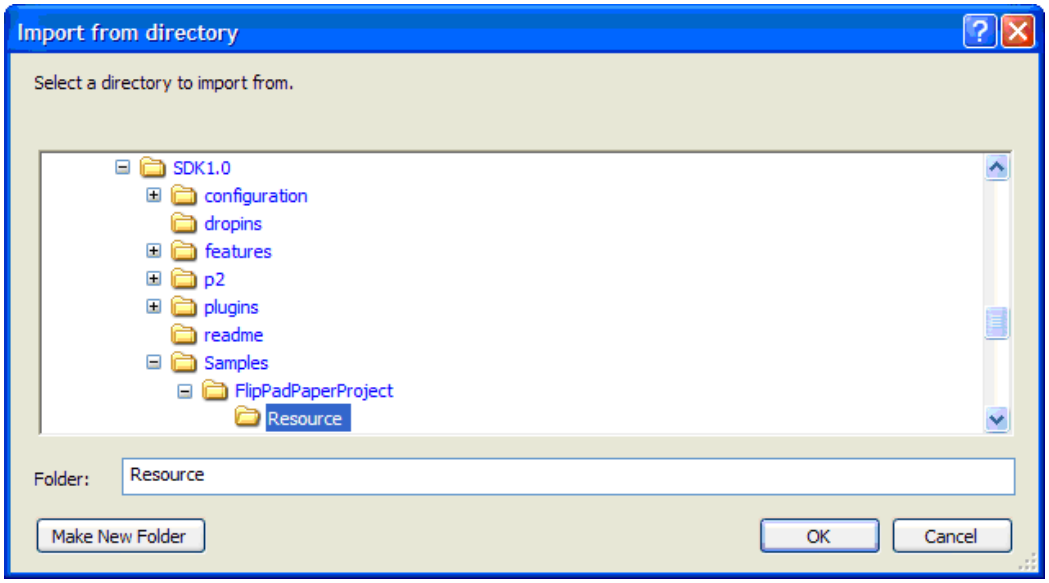
This completes your paper product design. Next, return to the Penlet perspective to complete your penlet code. Refer to the Livescribe SDK Javadoc, *Developing Penlets, and User Experience Guidelines* for information about how to design the best penlet for your application goals.

Import the Hello World Audio File

For this example, you will design your application to play a Hello World audio file when a specific Active Area is tapped by the user. To enable this, first import the audio file as a resource.

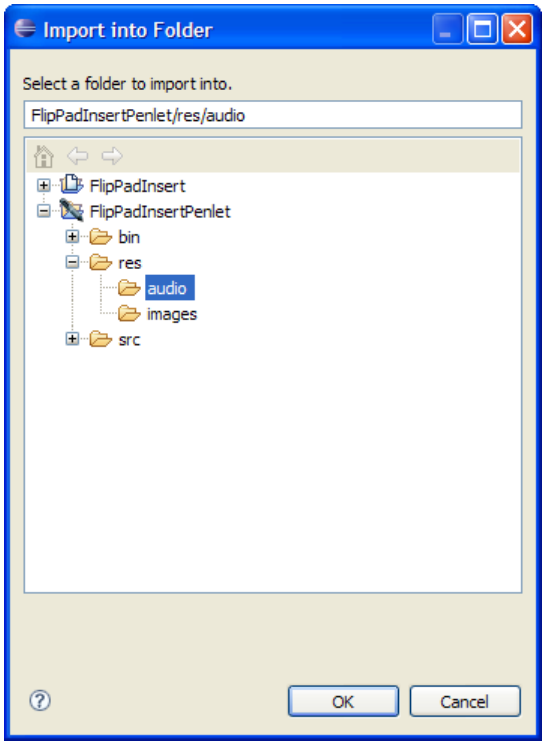
1. Choose **Window** > **Open Perspective** > **Penlet**.
2. Open the **FlipPadInsertPenlet.java** file to view it in the editor.
3. Select the **FlipPadInsertPenlet** in the Package Explorer tree.
4. Choose **File** > **Import**.
5. In the Import dialog, choose **General / Filesystem**, and click **Next**.

6. In the Import File system dialog, click **Browse** next to the **From directory** text box.
7. Navigate to the Livescribe SDK installation package and select the **\Samples\FlipPadPaperProject\Resource** folder, and click **OK** to return to the Import File system dialog.



8. In the Import File system dialog, check the **HelloWorld.wav** check box
9. Choose a destination folder. Click Browse next to the **Into folder** text box.
10. By default, the dialog will display project folders in your workspace. Select the **FlipPadInsertPenlet** penlet project folder, and select the **res/audio** folder.

Click **OK** to return to the Import File system dialog.



11. Click **Finish** in the Import File system dialog to import the wav file to your paper penlet project folder.

Set Up the Media Player

To play a sound on a smartpen, your penlet needs to instantiate the MediaPlayer. To do this, add the highlighted lines of code to your penlet. The first line imports the MediaPlayer libraries. The second line declares player as MediaPlayer for this penlet. The third line instantiates the MediaPlayer when the penlet is initialized.

```
package com.yourcompany.flipPadPenlet;

import com.livescribe.penlet.Penlet;
import com.livescribe.penlet.Region;
import com.livescribe.ui.MediaPlayer;
import com.livescribe.afp.PageInstance;
import com.livescribe.event.PenTipListener;

public class FlipPadInsertPenlet extends Penlet implements PenTipListener {
    private MediaPlayer player;
    public FlipPadInsertPenlet() {
    }

    /**
     * Invoked when the application is initialized.  This happens once for an application
instance.
     */
    public void initApp() {
       this.player = MediaPlayer.newInstance(this);
       this.logger.info("Penlet FlipPadInsertPenlet initialized.");
```

```
    }
```

Edit the PenDown Method

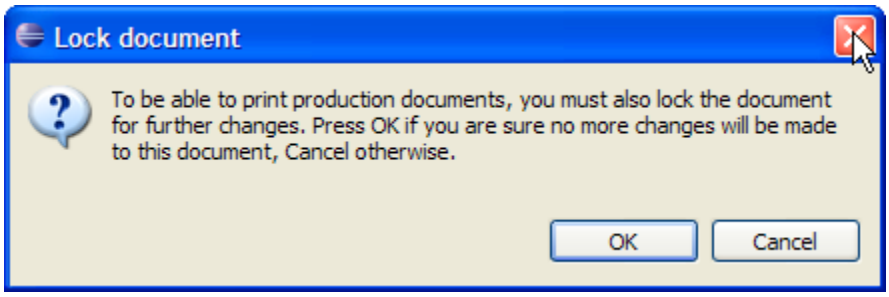
Next, edit the `onTapAndPlaySoundPenDown` stub code that was auto-generated by the Paper Designer for your Active Region. Add the highlighted code to instruct the `MediaPlayer` to play the Hello World audio file when the smartpen detects a `penDown` event on the `TapAndPlaySound` Active Region.

```
    protected boolean onTapAndPlaySoundPenDown(long time, Region region, PageInstance
page) {
        this.player.play("/audio/helloworld.wav");
        return true;

    }
```

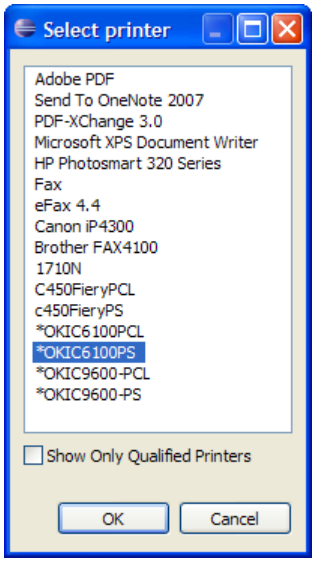
Print and Test the Paper Product and Penlet

1. Deploy the penlet to your smartpen by right-clicking the Penlet project and selecting **Deploy to Smartpen**.
2. Print your paper product using the AFD. Right-click the **LS_FLNP_Card.afd** file in the src folder and choose **Print**.
3. Click **OK** at the **Lock document** prompt.

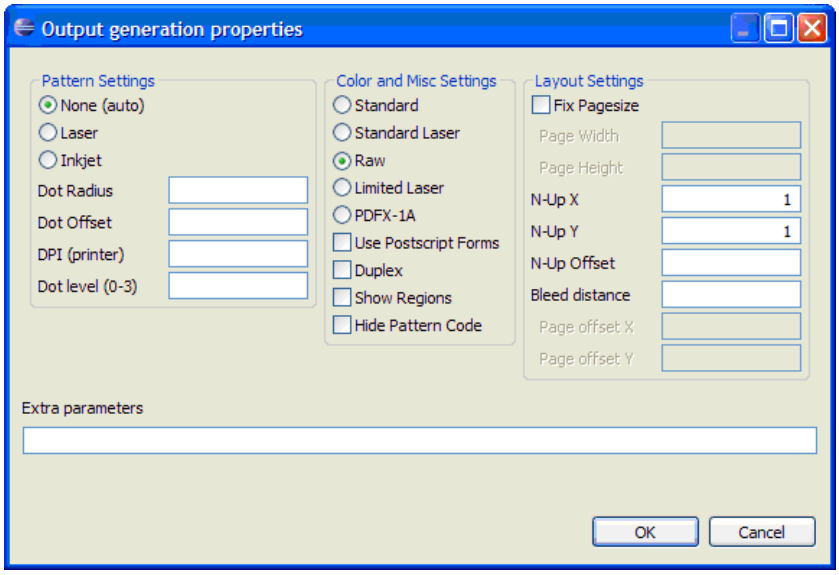

Lock document
To be able to print production documents, you must also lock the document for further changes. Press OK if you are sure no more changes will be made to this document, Cancel otherwise.
OK
Cancel

4. In the Select printer dialog, select the printer you want to use and click **OK**. When printing, you should use a recommended printer. However, other printers can also work. See the **Recommended Printers** section in

Developing Paper Products for more information.



5. In the next dialog, select the printing properties to use. For this example, choose the settings below.



Note: When testing your paper product, you will use the default developer test pattern provided by the Paper Designer. When you are ready to publish the paper product for distribution, you will need to obtain a unique dot pattern license from Livescribe using the Livescribe Pattern Server.

6. From the Project Explorer, select the source AFD file in the src folder, and right-click to select **Deploy to Smartpen**.
7. After deploying your penlet, and deploying and printing your paper product, test your application. Tap on any of the printed controls to see that they work

as expected. All the standard Livescribe controls should work like any other Livescribe paper products. You should be able to tap on the Record button to start Paper Replay. Tapping the Nav Plus should invoke the Main Menu.

8. On the Main Menu, scroll down to the menu item called **My Apps**. From there, locate your new application (**Flip Pad**). Right tap on the Nav Plus to start the application.
9. Next, tap on the custom Active Area you defined for the Livescribe Dot Paper logo. It should play the Hello World wav file as you intended.

Command Reference

This section is a reference of the wizards and dialogs of the Penlet Feature.

Menus

These are the menus available in the Penlet perspective that apply to penlet development.

Livescribe

To access this menu, select **Livescribe** on the main menu bar at the top of your Eclipse window.

The Livescribe menu has one item.

Menu Item	**Action**
Resource Converter	Displays the Livescribe Resource Converter

File > New

To access this menu, select **File > New** on the main menu bar at the top of your Eclipse window.

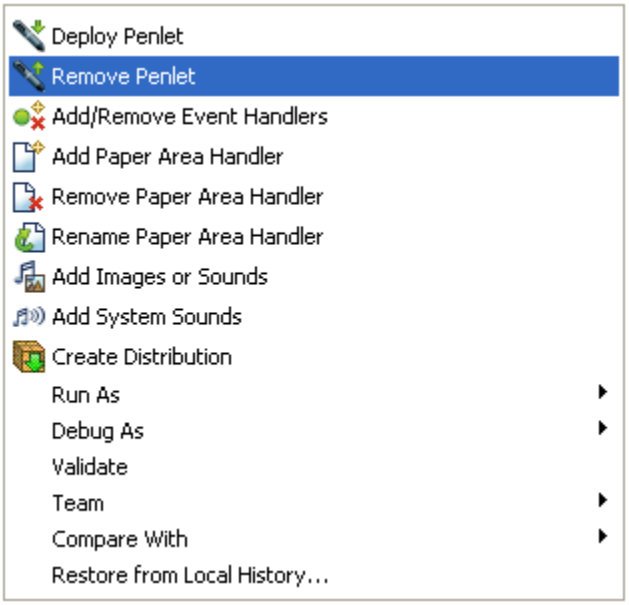
The **File > New** menu contains two items that pertain to development on the Livescribe Platform.

Menu Item	**Action**
Livescribe Penlet Project	Launches the Livescribe Penlet Project Creation Wizard
Livescribe Paper Project	Launches the Livescribe Paper Product Wizard. For details, see the manual titled *Developing Paper Products.*

Context Menu

To access this menu, highlight the **top node** of a penlet project in one of the resource navigation views: Project Explorer, Package Explorer, and Navigator. A long

context menu appears. Near the end are the menu items pertaining to development for the Livescribe Platform.



The items in the context menu are:

Menu Item	**Description**
Deploy Penlet	Uploads the penlet JAR to the smartpen
Remove Penlet	Uninstalls the penlet from the smartpen
Add/Remove Event Handlers	See Add/Remove Event Handlers
Add Paper Area Handler	See Add Paper Area Handler
Remove Paper Area Handler	See Remove Paper Area Handler
Rename Paper Area Handler	See Rename Paper Area Handler
Add Images or Sounds	See Add Images, Sounds, or Resources
Add System Sounds	See Add System Sounds to the Selected Project
Create Distribution	Creates a deployable JAR file for the project

Alphabetical Reference

This section is an alphabetical reference of dialogs and wizards. Look up an item by the name of the page (in a wizard) or the name of the dialog.

Add Images, Sounds, or Resources

This command allows you to add one of the following to your penlet project:

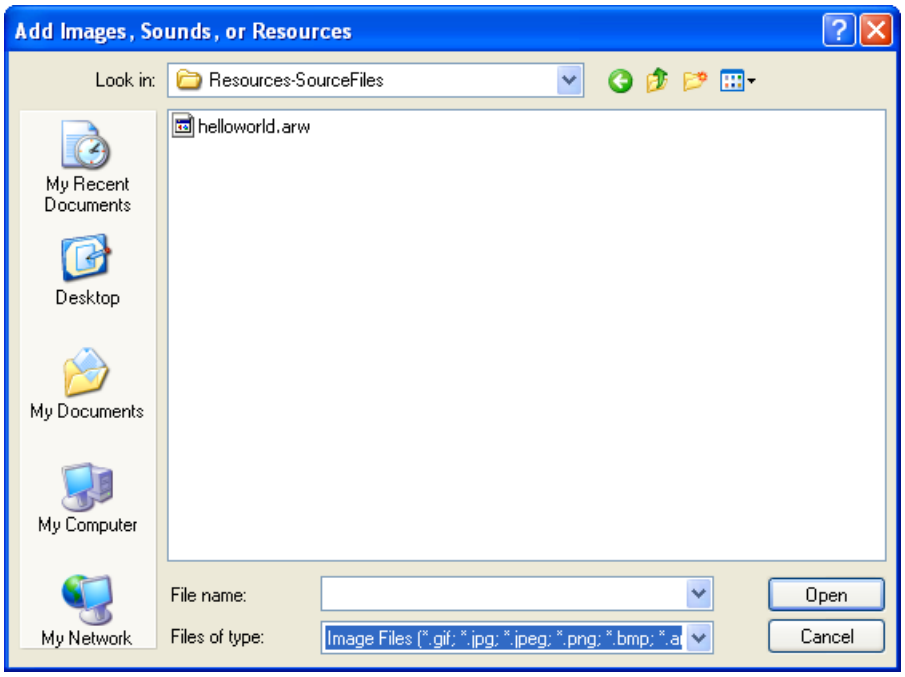
- image for display on the smartpen OLED
- sound to be played on your penlet project.

To access this command:

1. Right-click the top node of the project in Package Explorer. Select Add Images or Sounds from the context menu.

   The Add Images, Sounds, or Resources dialog appears.
2. Select Image Files or Audio Files from the Files of type drop-down box.
3. Navigate to the file(s), highlight, and click Open.

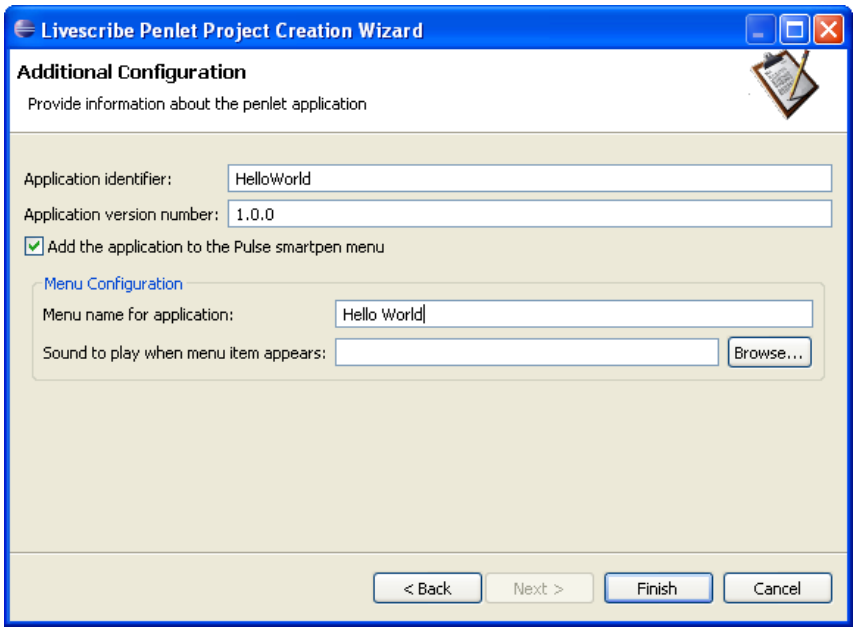
   Images will be added to the `res/images` directory and sounds will be added to the `res/audio` directory of the penlet project.



Additional Configuration Page

This is the third page of the Livescribe Penlet Project Creation Wizard. It allows you to add your penlet to the smartpen's main menu, control penlet ID and version number, and configure the penlet's behavior in the smartpen's main menu. When deployed, your penlet becomes part of the MyApps submenu of the smartpen's main menu.

Note: This is not the same as creating a single- or multi-dimensional menu for your penlet.



The Additional Configuration page appears. On this page you can modify:

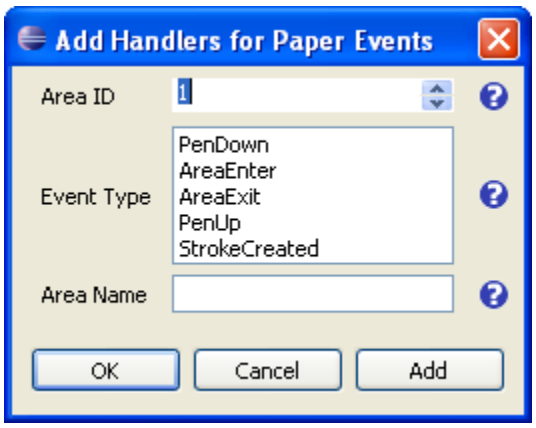
Field Label	Explanation	Default Value
Application identifier	Name of the built penlet	The built penlet has the same name as the project
Application version number	The version number of the penlet	Penlet version is 1.0.0.
Add the application to the Pulse smartpen menu	Whether the penlet appears on the smartpen's main menu.	Penlet will appear as an item on the smartpen's main menu
Menu name for application	Name that appears in the smartpen's main menu for the penlet.	Penlet's name on the main menu is the same as the project name

Sound to play when menu item appears	Audio file (if any) that plays when the penlet's menu item rolls into view in the smartpen's main menu.	No audio file.

Note: The audio we are concerned with here is played only when the user is scrolling through the smartpen's main menu. When the penlet's name rolls into view in the OLED, the sound plays. Not all penlets have this menu sound.

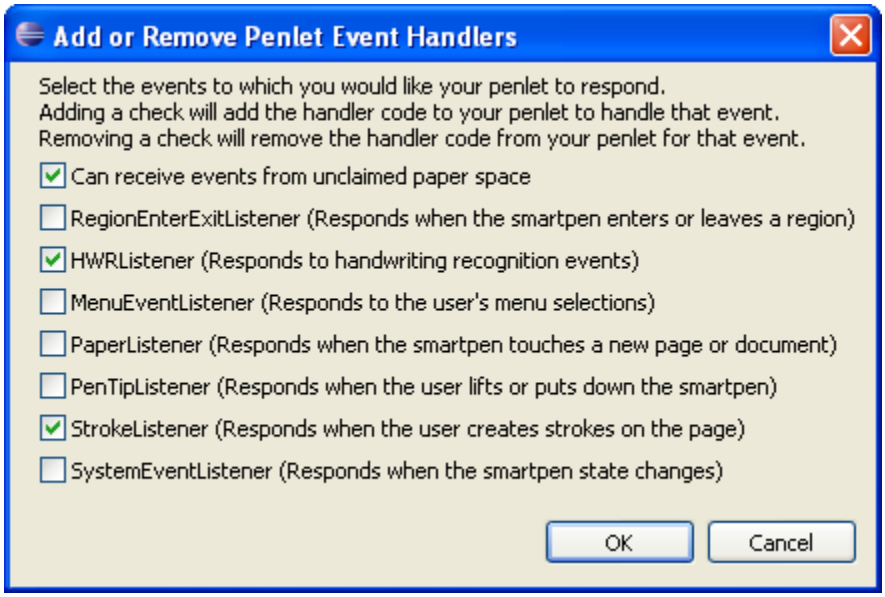
Add Paper Area Handler

This dialog allows you to add one or more event handlers for an area associated with FP (Fixed Print) paper. The code generator inserts appropriate code in your source to support an area. Each Area ID and Area Name must be unique within the penlet. The Area ID is a positive integer value. The Area Name is a string conforming to Java naming conventions (e.g., no spaces allowed).



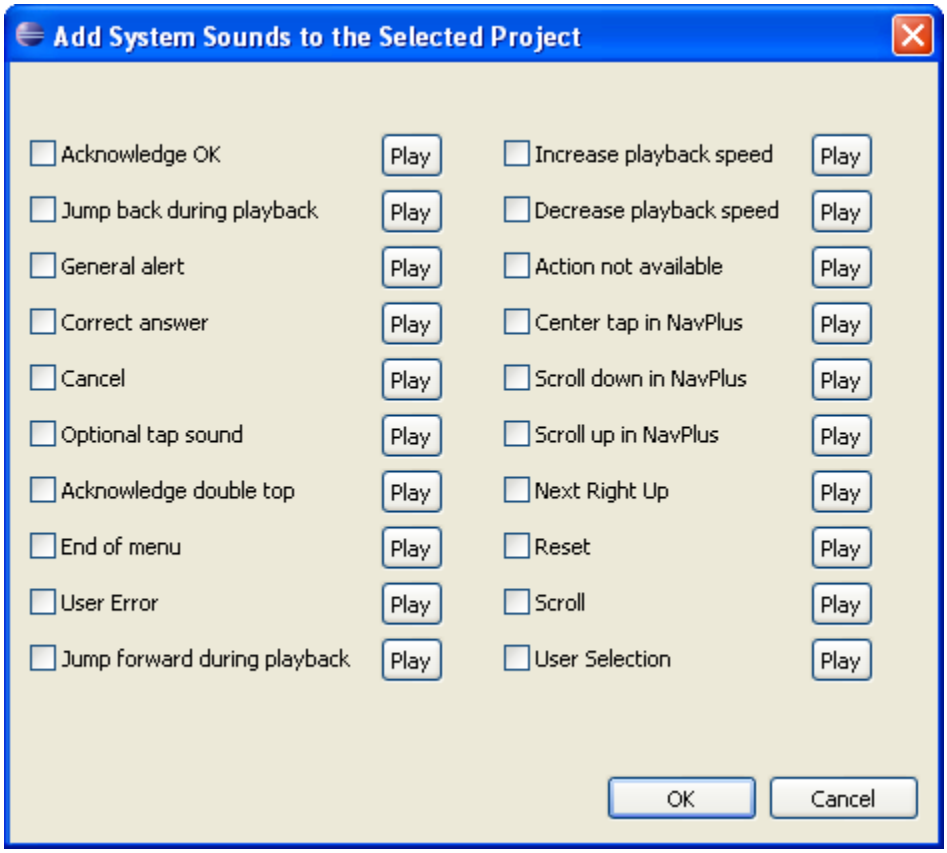
Add/Remove Event Handlers

This dialog allows you to add and remove event handlers to/from the source code of your penlet project. The checkbox options are identical to the Event Configuration page of the Livescribe Penlet Project Creation Wizard. See Event Configuration Page.


Add or Remove Penlet Event Handlers
Select the events to which you would like your penlet to respond.
Adding a check will add the handler code to your penlet to handle that event.
Removing a check will remove the handler code from your penlet for that event.
Can receive events from unclaimed paper space
RegionEnterExitListener (Responds when the smartpen enters or leaves a region)
HWRListener (Responds to handwriting recognition events)
MenuEventListener (Responds to the user's menu selections)
PaperListener (Responds when the smartpen touches a new page or document)
PenTipListener (Responds when the user lifts or puts down the smartpen)
StrokeListener (Responds when the user creates strokes on the page)
SystemEventListener (Responds when the smartpen state changes)
OK
Cancel

Add System Sounds to the Selected Project

The fourth option, **Add System Sounds**, lets you insert additional audio files (*.wav) into the currently selected project. The following figure shows what the **Add System Sounds** dialog box looks like.



Click the **Play** button to hear the sound produced by the audio file. To choose one or more system sounds, click the corresponding checkboxes in the dialog. Then click **OK** to add them to the currently selected project. The selected WAV files will be placed in the `/res/audio` directory.

ARW Editor

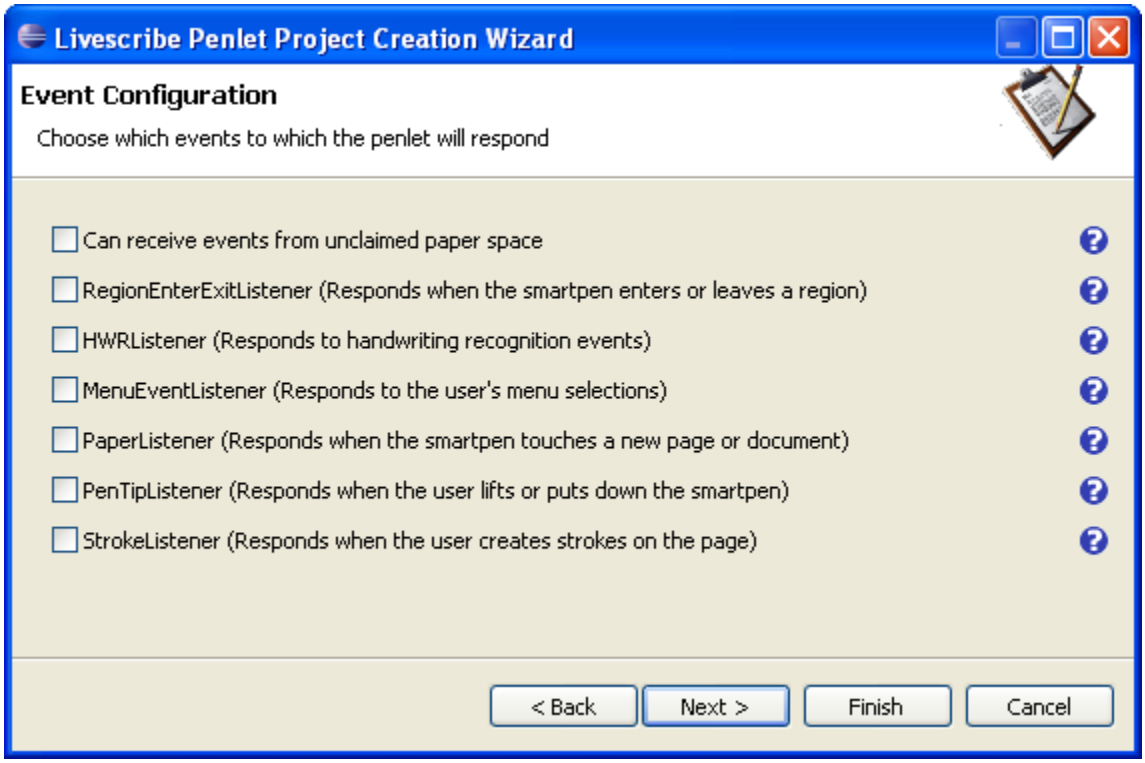
ARW is a proprietary monochrome format used specifically with the Pulse smartpen. The SDK's Resource Converter converts existing images to ARW, but can't be used to edit them.

Images are found in the `res/images` directory of your penlet project. To activate the ARW editor, double-click on an ARW file in the Package Explorer. The ARW editor appears in its own window.

The ARW editor is a 1-bit pixel editor. By clicking in the editor, you can convert dark pixels to light or vice-versa. You can also drag the mouse over the image to color additional pixels in the area.

Event Configuration Page

This is the second page of the Livescribe Penlet Project Creation Wizard. Checking an item will create event listeners and event handler stubs that you can implement later.


Livescribe Penlet Project Creation Wizard
Event Configuration
Choose which events to which the penlet will respond
Can receive events from unclaimed paper space
RegionEnterExitListener (Responds when the smartpen enters or leaves a region)
HWRListener (Responds to handwriting recognition events)
MenuEventListener (Responds to the user's menu selections)
PaperListener (Responds when the smartpen touches a new page or document)
PenTipListener (Responds when the user lifts or puts down the smartpen)
StrokeListener (Responds when the user creates strokes on the page)
< Back
Next >
Finish
Cancel

Option	Listener Adds These Methods:
Can receive events from unclaimed paper space	`canProcessOpenPaperEvents` and sets return value to true.
RegionEnterExitListener	`regionEnter` `regionExit`

HWRListener	`hwrCrossingOut`
	`hwrError`
	`hwrResult`
	`hwrUserPause`

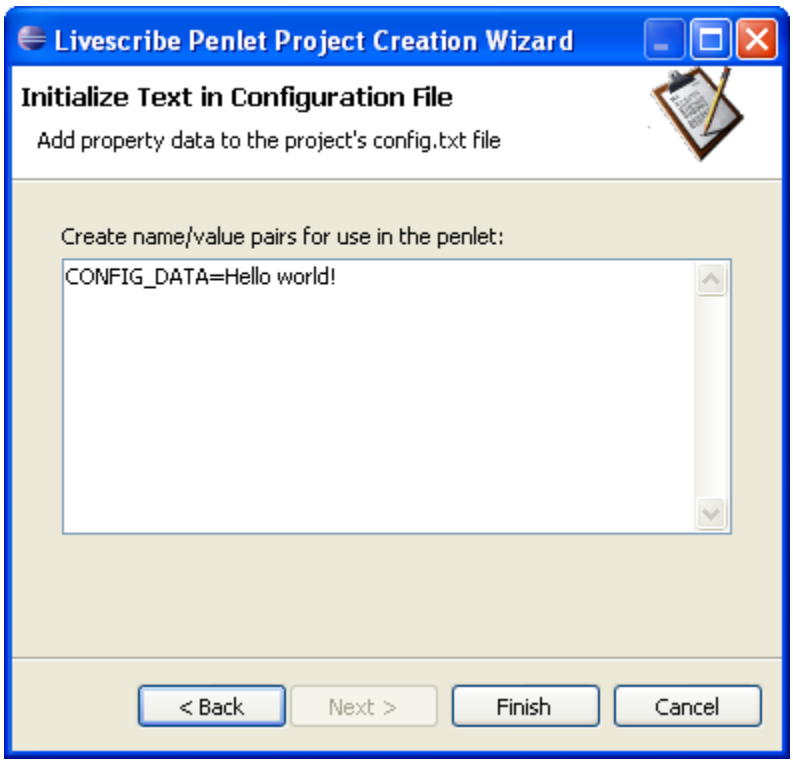
MenuEventListener	`handleMenuEvent`
PaperListener	`onNewDocument` `onNewPage`

PenTipListener	`penDown`
	`penUp`
	`singleTap`
	`doubleTap`

StrokeListener	`strokeCreated`
SystemEventListener	`handleSystemEvent`

Initialize Text in Configuration File

This page of the wizard appears only if you chose **Read properties from a resource file** on the Penlet Project Creation Page. Specify name-value pairs, which will be written to the `config.txt` file. The penlet reads this file when it is launched. And your code can read these pairs at runtime.


Livescribe Penlet Project Creation Wizard
Initialize Text in Configuration File
Add property data to the project's config.txt file
Create name/value pairs for use in the penlet:
CONFIG_DATA=Hello world!
< Back
Next >
Finish
Cancel

Import

When you create a penlet project using Livescribe's Penlet feature, the Eclipse workspace recognizes the project as being Livescribe-specific. However, projects created outside the Penlet feature, such as the Livescribe sample projects, won't be recognizable. This means you won't be able to run the deploy action on these projects or perform similar Livescribe-specific tasks.

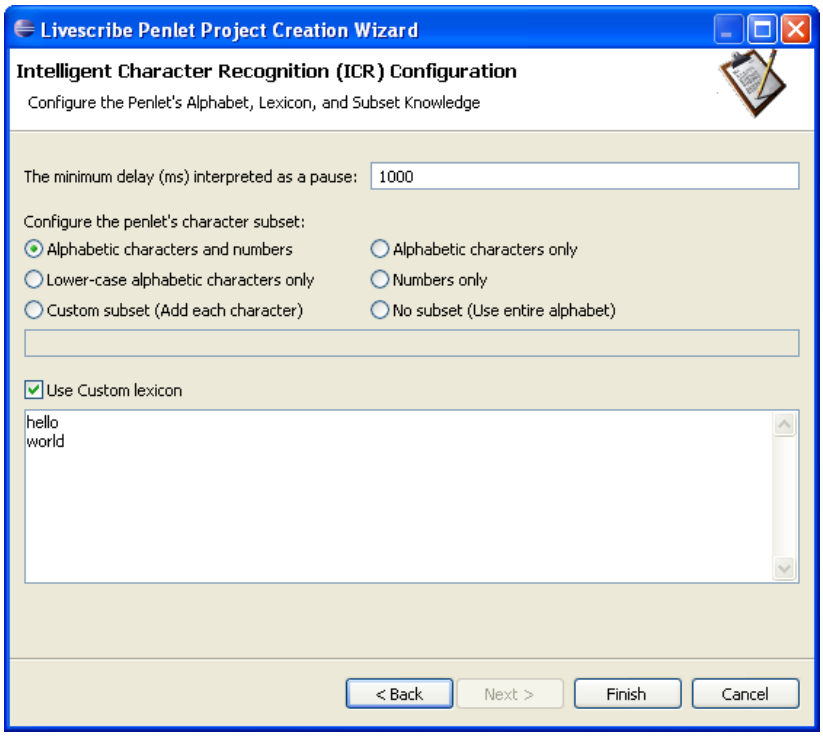
For this reason, the Eclipse feature provides an import project wizard for converting externally-generated projects into Livescribe-specific projects.

1. Select **File > Import.** . The Import wizard starts.
2. Select **Livescribe > Livescribe Penlet Project** from the Select page of the wizard.
3. Select the option labeled **Select archive file**. Browse to the root directory of your penlet project.
4. Click **Finish**.

Intelligent Character Recognition (ICR) Configuration

This page of the wizard appears only under one of the following circumstances:

- if you select **Recognize written characters** in the Penlet Project Creation Page.
- if you select **HWRListener (Responds to handwriting recognition events)** in the Event Configuration Page of the Livescribe Penlet Project Creation Wizard.
- if you select **HWRListener (Responds to handwriting recognition events)** in the Add/Remove Event Handlers dialog.



The Intelligent Character Recognition (ICR) Configuration page allows you to specify values that will limit the scope of writing the ICR engine's will recognize. You choose to specify a subset of the total possible characters for two reasons:

- to improve accuracy. For example, an "I" can look like a numeral "1." If you limit your penlet's recognition capabilities to only numerals, you have increased the chances for accurate recognition.
- to improve performance. You can optimize the ICR engine's speed by limiting the set of characters if needs to recognize.

You specify a custom lexicon to restrict the ICR engine to recognize only these terms—which can improve both accuracy and performance.

Option	**Action**
The minimum delay (ms) interpreted as a pause	Specifies the period of time without the user making new strokes that the ICR engine will interpret as a pause (and usually, the end of the stroke). In milliseconds.
Configure the penlet's character subset	**(See table below)**
Use Custom lexicon	Words you specify here will be inserted in a custom lexicon. No other words will be recognized.

The following table describes the available subsets of the entire character set. You can select only one of these.

Option	**You specify a subset of the total possible characters**
Alphabetic characters and numbers	Alphabet characters and numerals only
Alphabetic characters only	Alphabet characters only (both upper and lower case)
Numbers only	Numerals (1 2 3, etc.) only—no decimal points, commas, nor positive/negative signs allowed.
Custom subset (Add each character)	Only the characters you enter in the field
Lower case	Alphabet characters—lower case only.
No subset (Use entire alphabet)	Uses all alphabet characters, numerals, punctuation

Livescribe Penlet Project Creation Wizard

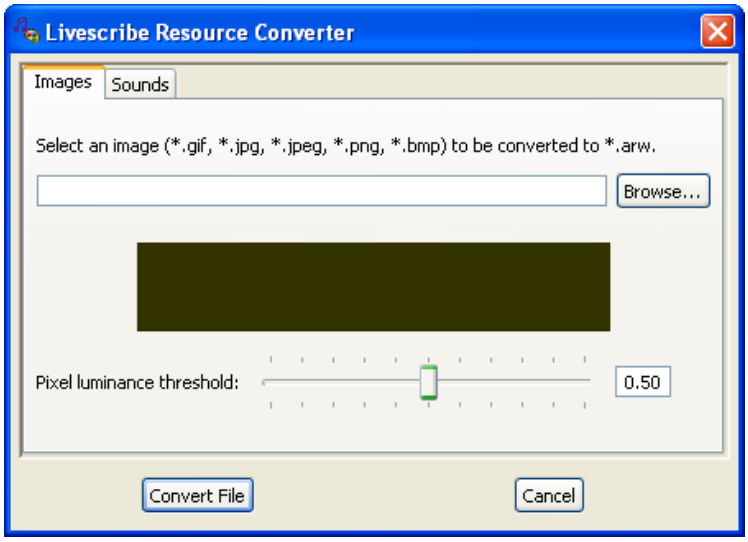
Launch the Livescribe Penlet Project Creation Wizard by selecting **File > New > Livescribe Penlet Project**. The wizard consists of three pages:

- Penlet Project Creation Page
- Event Configuration Page
- Additional Configuration Page

Livescribe Resource Converter

The Pulse smartpen can play audio files and display images, but only if the resource files are suitably formatted. Image files must be converted into the Livescribe-specific ARW format, and audio files must be either WAV (*.wav) files, WavPack (*.wv) files, or AAC-LC (*.aac) files.

The Livescribe IDE provides a utility for converting resources, and you can access the Resource Converter dialog by choosing the **Livescribe > Resource Converter** menu item or by clicking the icon in the toolbar.



Images Tab

The first tab converts images (*.gif, *.jpg, *.png, and *.bmp) to the pen-supported ARW format. Click **Browse** to bring up a file selection dialog, then click **Save File** to save the converted image into the currently-selected project.

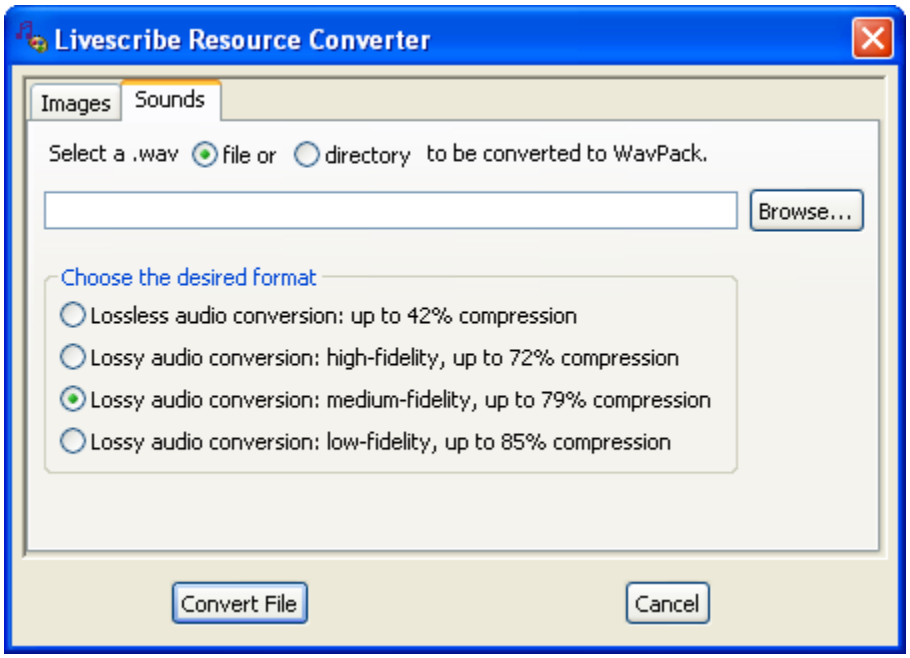
Below the file selection text box, the preview canvas shows what the converted image will look like. If the original image is a color image, each color in the image will be converted to a luminance value between 0.0 and 1.0. By default, pixels with a luminance greater than 0.5 will be colored white, while those with a luminance less than 0.5 will be colored black in the ARW image. You can adjust the luminance threshold by adjusting the scale.

Sounds Tab

The second tab in the Resource Converter dialog makes it possible to convert audio files. The Pulse smartpen supports three different file formats: WAV (*.wav),

WavPack (*.wv), and AAC-LC (*.aac). The WavPack format provides the same quality as wav, but the converted files are approximately half the size. The AAC-LC format provides slightly-diminished quality conversion, but with significantly-reduced file size.

The following figure shows what the audio conversion capability looks like on Windows.

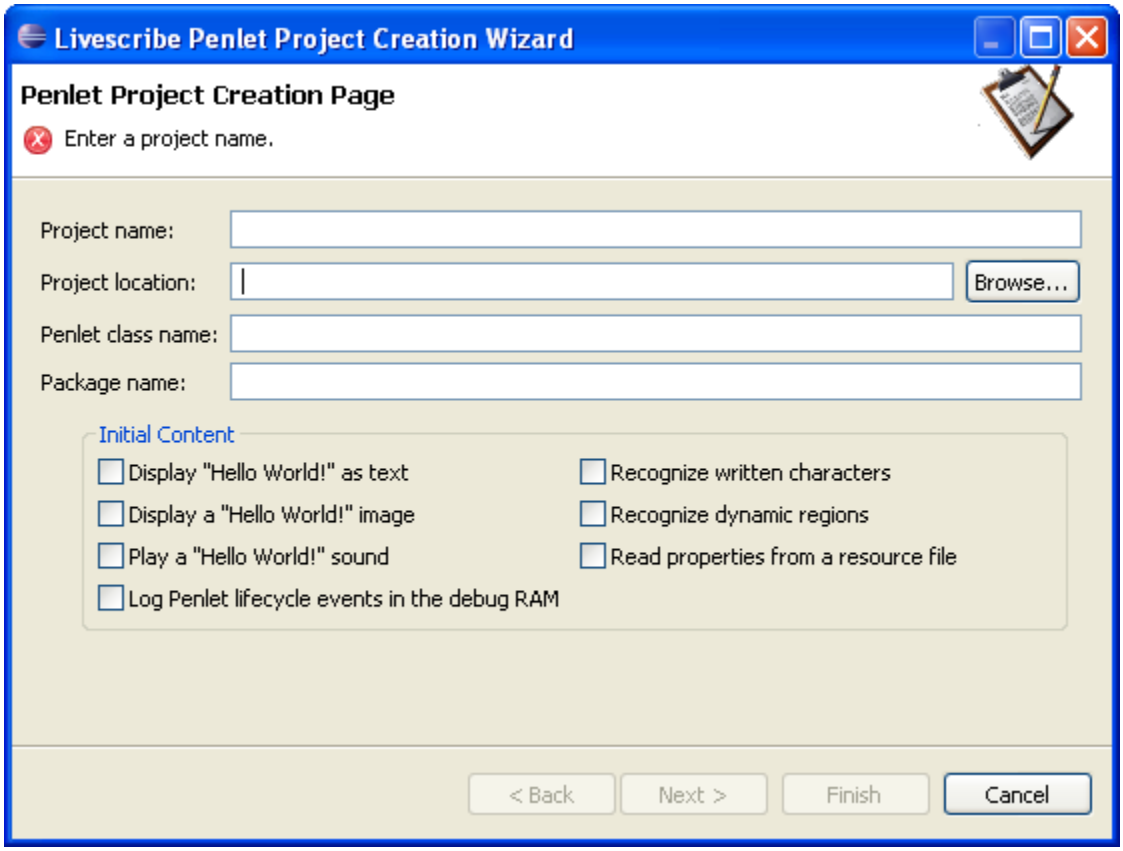


To perform audio conversion, click the **Browse...** button and navigate to the WAV file you intend to convert. Select one of the two conversion choices and click **Save File** to add the converted file to your penlet project.

Note: Not all audio files can be converted or played on the Pulse smartpen. To be convertible, all WAV files must be sampled at 16kHz, with 16 bits per sample.

Penlet Project Creation Page

This is the first page of the Livescribe Penlet Project Creation Wizard. It consists of two halves.



In the top half, you specify the project name, project location on your file system, and the package name.

In the bottom half, you can specify what kind of functionality you would like the automatic code generator to insert in your penlet. The corresponding listeners and stubs for the associated event handlers will be generated for you by the wizard.

This generated code provides simple actions. You can learn some basics of penlet programming by studying the code. Later, you might want to start with the default code of these event handlers and modify them to fit the needs of your new penlet.

The following table summarizes the options of the Initial Content section (bottom half) of the Penlet Project Creation Page:

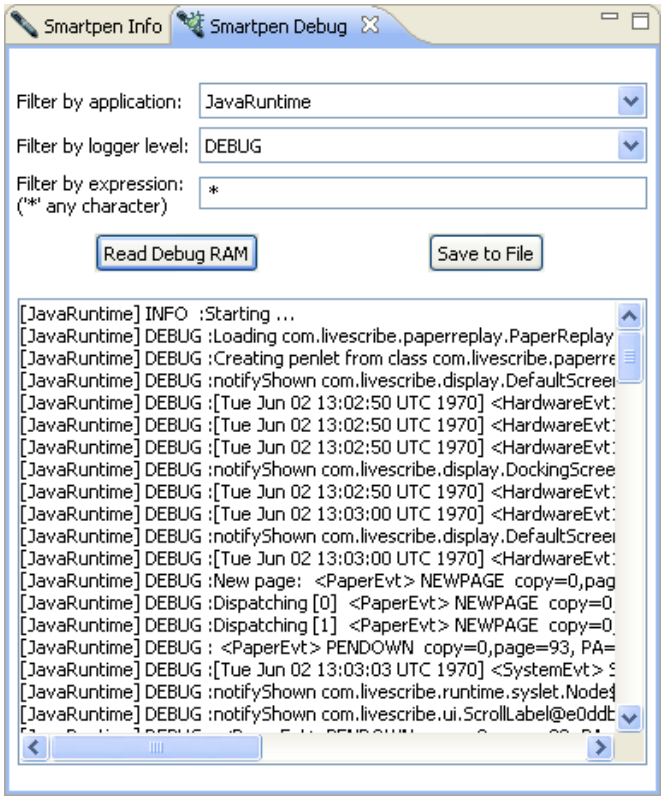
Option	**Inserts code for:**
Display "Hello World" as text	Displaying "Hello World" on the OLED of the smartpen. Text displays when penlet is launched.
Display a "Hello World" image	Displaying an image (in ARW format) on the OLED of the smartpen. Image displays when penlet is launched.
Play a "Hello World" sound	Playing a sound on the smartpen when the penlet is launched.
Log Penlet lifecycle events in the debug RAM	Outputting debug statements that identify the execution of life cycle events in the penlet. Output is to the Smartpen debug RAM. The debug RAM may be viewed via the Debug View in Eclipse. 1. Deploy penlet. 2. Use a Nav Plus to navigate through the smartpen's main menu. 3. Launch the penlet. 4. In the Smartpen Debug View, select **LifeCycleEvents** from the **Filter by application** drop-down box. 5. Click **Read Debug RAM**.
Recognize written characters	Recognizing characters written by the user on Open Paper.
Recognize dynamic regions	Creating a region when the user draws a shape on Open Paper. Subsequently, when the user interacts with the shape, the penlet is activated.
Read Properties from a resource file.	Writing a single `name=value` pair (CONFIGDATA=Hello World!) to the `config.txt` file. When launched, the penlet reads this property and displays the name and its value on the smartpen OLED.

Smartpen Debug View

Select **Window -> Show View -> Smartpen Debug**. (Alternatively, you may have to select **Window -> Show View -> Other** and then select **Livescribe -> Smartpen Debug**.) The Smartpen Debug view appears.

This view displays the debug messages currently stored on the smartpen. The information includes the most recent penlet- and system-related events. You can

examine this output to discover the events that occurred during the smartpen's recent operation.


Smartpen Info
Smartpen Debug
Filter by application:
JavaRuntime
Filter by logger level:
DEBUG
Filter by expression:
('*' any character)
*
Read Debug RAM
Save to File
[JavaRuntime] INFO :Starting ...
[JavaRuntime] DEBUG :Loading com.livescribe.paperreplay.PaperReplay
[JavaRuntime] DEBUG :Creating penlet from class com.livescribe.paperre
[JavaRuntime] DEBUG :notifyShown com.livescribe.display.DefaultScree
[JavaRuntime] DEBUG :[Tue Jun 02 13:02:50 UTC 1970] <HardwareEvt:
[JavaRuntime] DEBUG :[Tue Jun 02 13:02:50 UTC 1970] <HardwareEvt:
[JavaRuntime] DEBUG :[Tue Jun 02 13:02:50 UTC 1970] <HardwareEvt:
[JavaRuntime] DEBUG :notifyShown com.livescribe.display.DockingScree
[JavaRuntime] DEBUG :[Tue Jun 02 13:02:50 UTC 1970] <HardwareEvt:
[JavaRuntime] DEBUG :[Tue Jun 02 13:03:00 UTC 1970] <HardwareEvt:
[JavaRuntime] DEBUG :notifyShown com.livescribe.display.DefaultScree
[JavaRuntime] DEBUG :[Tue Jun 02 13:03:00 UTC 1970] <HardwareEvt:
[JavaRuntime] DEBUG :New page: <PaperEvt> NEWPAGE copy=0,pag
[JavaRuntime] DEBUG :Dispatching [0] <PaperEvt> NEWPAGE copy=0
[JavaRuntime] DEBUG :Dispatching [1] <PaperEvt> NEWPAGE copy=0
[JavaRuntime] DEBUG : <PaperEvt> PENDOWN copy=0,page=93, PA=
[JavaRuntime] DEBUG :[Tue Jun 02 13:03:03 UTC 1970] <SystemEvt>
[JavaRuntime] DEBUG :notifyShown com.livescribe.runtime.syslet.Node
[JavaRuntime] DEBUG :notifyShown com.livescribe.ui.ScrollLabel@e0ddb

The Debug RAM messages can be filtered in three ways:

- *Filter by application*- If the smartpen's penlets are listed in the Smartpen Info view, you can filter messages that were output by a particular penlet.
  - **JavaRuntime** displays the log messages output by the smartpen's runtime.
  - **<System>** displays the log messages generated by the smartpen's low-level firmware.
- *Filter by logger level* - The data log on the smartpen can have four types of messages: **DEBUG**, **INFO**, **WARN**, and **ERROR**. This drop-down list allows you to limit displayed messages to one of these types.

  Note: These log messages will be output to the data log only if the penlet code calls the appropriate methods (debug, `info`, `warn`, or `error`) of the `Logger` class.

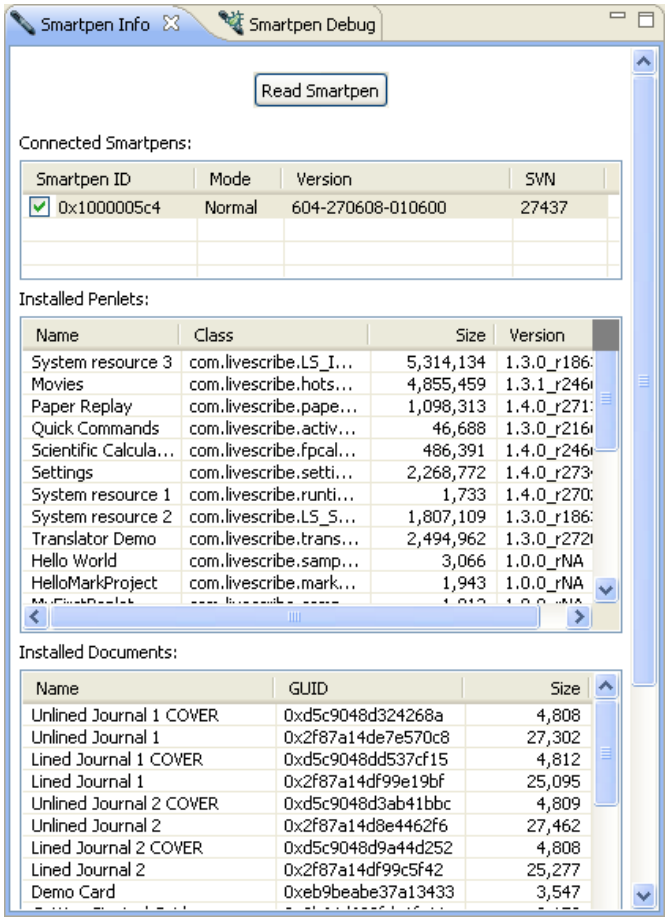
- *Filter by expression* - If you enter text in the Filter by expression box and press **Read Debug RAM**, all debug messages containing that text will be displayed. The wildcard * matches 0 or more occurrences of any characters. Thus, *c*t* matches: *cat*, *cot*, *caught*, and *ct*.

Click the **Read Debug RAM** button to display the smartpen's latest debug messages. You must click this button whenever you modify any of the filter settings.

Click the **Save to File** button to store the Debug RAM messages to a file on your computer. All data is saved as text.

Smartpen Info View

Select **Window -> Show View -> Smartpen Info**. (Alternatively, you may have to select **Window -> Show View -> Other** and then select **Livescribe -> Smartpen Info**.) The Smartpen Info view appears.



Click the **Read Smartpen** button in the Smartpen Info view. If no smartpens are connected, the first table will respond with the message No Smartpens Connected. If a smartpen is connected, its penlet classes and penlet documents (AFDs) will be listed in the Installed Penlets and Installed Documents tables.

You can also use these tables to uninstall your penlets and documents (AFDs) from the smartpen.

- To uninstall one of your penlets, right-click its name in the Installed Penlets table and select **Remove penlet "***MyPenletName***"** For instance, if you right-click on the HelloWorld penlet, the context menu item says: Remove penlet HelloWorld.

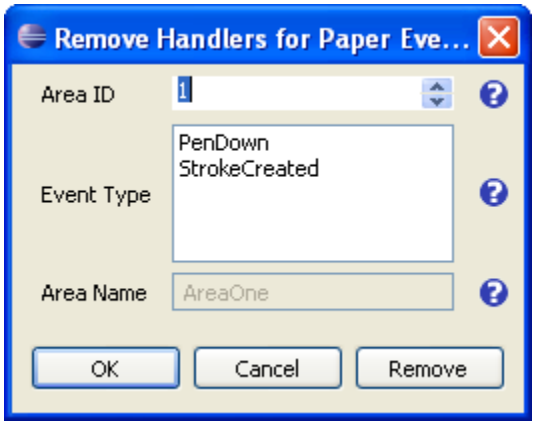
  Note: You cannot uninstall the system penlets or the penlets that come bundled with the Pulse smartpen.

- To uninstall any document, right-click its name in the Installed Documents table and select **Remove** *Document Name.* For instance, if you right-click on the Tutorial document, the context menu item says: Uninstall Tutorial.

  Note: Be careful when removing documents. If you uninstall one of the Livescribe notebooks or notepads, such as Lined Journal 3, your smartpen will no longer recognize that Livescribe paper product.

Remove Paper Area Handler

This dialog allows you to remove one or more event handlers for an area associated with FP (Fixed Print) paper. The code generator removes code from your source that it originally inserted to support the event handler(s).



Rename Paper Area Handler

This dialog allows you to rename an event handler for an area associated with FP (Fixed Print) paper.

Glossary

This section lists terms and definitions important to developing applications for Pulse smartpens.

3D Recording Headset: Earphones with embedded microphones that capture multi-directional, far-field audio and place objects in the sound landscape surrounding you.

Active Area: See **Active Region**.

Active Ink: Digitized writing/drawing that can be viewed in Livescribe Desktop—in normal mode or in animation mode. Clicking on a note starts playing the audio at the associated point in the audio stream. Related concepts: ***Animation***

Active Region: A portion of paper defined such that when a user taps on it, the associated penlet responds. You can think of an Active Region like a paper button or control. Active Regions may overlap in which case their Z-order defines the ordering of events delivered and their occlusive property defines whether active regions with lower Z-orders are processed at all. Active Regions can be dynamic (created at runtime – like the Livescribe Piano) or static (pre-defined in a paper product's AFD and established at penlet installation time – like standard Paper Replay controls). See **Dynamic Regions** and **Static Regions**.

Active Verb: Small applications that can be activated on the Pulse smartpen by writing a single word. The user must first enter the Active Verb mode by performing a defined action. At present, that action consists of the user double-tapping the center of a Nav Plus.

AFD: The persistent electronic representation of a paper product. It is used for communication between the Livescribe system components (that is: the Pulse smartpen, Livescribe Desktop, Livescribe Online, and Livescribe Developer Tools). A ZIP-like archive that can hold arbitrary content, it is accessed via the Anoto Functionality Platform Document API. Each step in the application and UGC lifecycle adds or removes items in an AFD. The components of an AFD include: Anoto License, GFX File, Regions File, Info File, Java JAR, Resources, and Tools Data.

AFP: Anoto Functionality Platform. Software modules created by Anoto and licensed by Livescribe. Contains the functionality for creating AFDs, printing paper products, and licensing Anoto dots. All AFP services are abstracted by Livescribe's Java Abstraction Layer.

Animation: A mode for displaying Paper Replay notes in Livescribe Desktop. Normal mode reveals all the notes when the page is first displayed. Animation mode initially hides (or grays out) the notes. As the audio plays, notes are revealed onscreen in sequence with the audio stream. To the user, the notes look like they are writing themselves on the screen as the audio plays.

Anoto License: License for Anoto pattern page(s). A component of an AFD (Anoto Functionality Document).

Anoto pattern: consists of small dots (100 micrometers in diameter) arranged with a spacing of approximately 0.3 mm on an imaginary square grid.

Anoto Units: An Anoto Unit (AU) is the native resolution of the smartpen. One AU = 0.3/8 mm or roughly 677 DPI. This unit is the maximum precision of the Pulse smartpen and also the maximum precision that, for example a paper product's page size or an active region can be set to.

APM: Audio Punctuation Mark. The sounds the Pulse smartpen makes that give the user audio feedback.

Application Id: A locally-unique identifier within an AFD that specifies what penlet class name to link the Active Region to. The Application Id is a part of the Region Id. For Static Active Regions, it occupies the same location in the Region Id as the Instance Id. The application Id is only relevant when creating paper products and will be translated in the smartpen to the Instance Id of the application. See **Area Id, Region Id,** and **Instance Id.**

Application Mapping: A key-value pair table that resides in the AFD. The table has one entry for each application used on each paper product, and each key-value pair contains the Application Id and the class name.
At run time, when a Static Active Region is tapped by the user, the system takes the Application Id from the Active Region and fetches the class from the current document's Application Mapping table. With the class name, the system looks up the Instance Id for the current smartpen. It then modifies the event Region Id and exchanges the Application Id with the Instance Id. Therefore, Static Regions (drawn using the Paper Designer) use an Application Id that will be translated at run time to the Instance Id.
In contrast, Dynamic Regions (drawn at runtime and generated by penlet code), use the Instance Id of the application that created it.

For example, assume a smartpen has two applications, Paper Replay and Timer, with the following Instance Ids at run time:

Class = com.livescribe.paperreplay Instance Id = 10
Class = com.livescribe.timer Instance Id = 11

The Application Mapping Table for the smartpen is:
Application Id = 1 Class = com.livescribe.timer
Application Id = 2 Class = com.livescribe.paperreplay

Here, a Static Region, like the Record button for Paper Replay, would have Area Id = 2 and Application Id = 2. At run time, when the Static Region is tapped by the user, the event that is thrown will have Area Id = 2 and Instance Id = 10 (since Paper Replay has Instance Id = 10 in this particular smartpen)

Area: A collection of regions, possibly in multiple AFDs, with the same Area Id and that thus provide the same functionality.

Area Id: A 16-bit number that is a subset of the Region Id. It represents a smartpen behavior or action triggered when a user interacts with an Active Region. It is up to the developer to define which Area Id maps to which behavior, and implement the corresponding code. Multiple Active Regions on the same page or multiple pages, can share the same Area Id. In this case, each region will map to the same behavior in the penlet. For example, the mute button on each page of a Livescribe notebook is represented by multiple Active Regions (one per notebook page), but each share the same Area Id. Therefore, when a user taps on the Mute button on any page, the same Area Id is generated, which triggers the penlet code that activates the mute function. AreaId starts on 1 since the AreaId 0 is reserved for the system Crop region. See **Application Id**, **Region Id,** and **Instance Id.**

Claimed Open Paper: an expanse of dot paper that a penlet has claimed at run time by means of a **Dynamic Region**.

Claiming: The process by which a penlet associates a user Active Region with an expanse of dots in a paper product. When claimed, the dots become “active.” Claiming can happen at penlet installation (for Static Regions) or during penlet runtime (for Dynamic Regions).

Class Name: The base class in a penlet that subclasses com.livescribe.penlet.Penlet. The class name links an Active Region in a paper product to the penlet.

Custom Paper Product: A paper product that contains pre-printed graphics (other than lines) on more than 15% of its surface Region.

Data On Display: The state of an application indicating it has some data to display to the user when the Pulse smartpen goes into Notes Mode. This state allows the

system to delay showing the Default Screen. For example, a calculator application might have some result (such as data on the display). The Data On Display state allows the system to write out the result without activating Notes Mode.

Default Screen: This is the screen that is shown on the display when no application owns the display.

DFU: Device Firmware Upgrade. The process of upgrading the Pulse smartpen firmware. This process is also known as flashing the Pulse smartpen.

Dot Paper: Physical paper with predefined Livescribe dot pattern printed on it.

Dots: Navigation points printed on dot paper that allow the Pulse smartpen to know its own location on the paper. Developed by Anoto, Inc.

DRM: Digital Rights Management.

Dynamic Region: An Active Region created during run time on Open Paper in response to user interaction with the Pulse smartpen. The penlet creates dynamic regions that encompass the written input and can be tapped on like a “paper button” to trigger behavior in the penlet. For example, in Piano, the user creates dynamic regions when drawing piano keys and rhythm and instrument buttons. In Paper Replay, the user creates dynamic regions as the user takes notes during a recording. Later, the user taps on a note and the associated point in the audio starts to play. See **Open Paper**, **Active Region**, **Static Region**, **Claiming, Linking,** and **Fixed Print**.

Fixed Print (FP): Refers to a region of dot space on a Livescribe page that is pre-claimed by a Pulse smartpen application during application development. No other application can claim these Regions dynamically at runtime. Usually, printed graphics on the page identify these Regions to the Pulse smartpen user as “paper controls” for operating the application. Fixed Print regions can also pre-claim Active Regions for interpreting strokes. **Open Paper**, **Active Region**, **Static Region**, **Claiming, Linking,** and **Fixed Print**.

Fixed Print Application: An application that owns one or more Fixed Print (static) regions. The region is defined during the development of the application. Tapping on one of the static regions activates the application. An FP application can also be activated from the Main Menu system. All FP applications *must* be bound to a Paper Product via its AFD file.

Flashing a Pulse smartpen: See DFU.

FP: See **Fixed Print**.

GFX File: Anoto dots for page(s) and reference to background image in Resources. A component of an AFD (Anoto Functionality Document).

ICR: Intelligent character recognition (handwriting recognition).

Info File: Creator, version info, and so on. A component of an AFD (Anoto Functionality Document).

Instance Id: A 16-bit number to specify locally in a smartpen which application is running, and which instance of that application is running. The Instance Ids are assigned by the system either on installation of an application or when that application is started. The Instance Id for a specific application varies between different smartpens depending on user actions and what order the applications are installed. There may be multiple Instance Ids for the same application. For example, each Piano drawn on paper is a new instance. See **Application Id** and **Region Id**.

JAR: Archive file of Java classes for a Pulse smartpen penlet. A component of an AFD (Anoto Functionality Document).

Linking: The process by which a paper product's AFD is associated to one or more. Linking is done by the developer in the Paper Designer by adding applications to the paper product's application list.

Livescribe Desktop: The computer component of the Livescribe Platform. Livescribe Desktop that allows you to transfer, store, search, and replay notes from your computer. You can also upload your content to the Web, and manage applications and content on your Pulse smartpen.

Livescribe Online: The web community of Livescribe Pulse smartpen users who post and share Pulse smartpen content.

MIDlet: A Java application conforming to the Mobile Information Device profile.

myLivescribe profile: 250MB of personal space a Livescribe Pulse smartpen user is allotted at Livescribe Online to store and share notes.

Nav Plus: A pre-printed or hand-drawn plus sign that lets you navigate your Pulse smartpen applications and files via the Menu system. Nav Plus controls are pre-printed on Livescribe paper products, on the USB mobile charging cradle, and elsewhere. Users can create these dynamically on any unclaimed dot space by drawing a cross and double tapping on the center of the cross.

Note Pad: A collection of sheets of Open Paper, in which each sheet may have pre-printed graphical materials on no more than 15% of its surface Region (such as controls and tool bars), excluding ruled lines, grids, and page numbers which may appear on all or any part of the surface Region.

Notebook: Either a dot paper notebook or a Digitized version of one that the Pulse smartpen can interact with and that Livescribe Desktop can recognize and interact with.

Notes Mode: The state of the Pulse smartpen system in which no applications are running and the system is just capturing strokes written by the user on dot paper. The Pulse smartpen shows the Default Screen when the smartpen is in Notes Mode.

OLED: Organic Light-Emitting Diode. A display technology that requires no backlight and draws far less power than LCDs. The Pulse smartpen has an OLED display that is 18 x 96 pixels.

OP: See **Open Paper**.

Open Paper (OP) Application: An application that can dynamically claim Open Paper regions during runtime. OP applications are not bound to any Paper Product's AFD file, allowing the application to use any unclaimed dot space. Once OP applications are launched (by the Main Menu or through some other gesture) the application may create dynamic regions for input UI controls.

Open Paper (OP): Sections of a Livescribe dot page that are not currently claimed by a Pulse smartpen application, but are available to be claimed at runtime. When a user runs an application and writes on the dots, the currently active application can claim them. In general, a surface, or a portion of surface that is printed with parts of the dot pattern and on which no pre-printed materials other than ruled lines, grids, or page numbers appear. Open Paper has an Area Id of 0. When the system detects actions on Open Paper such as penDown, a Region Id with an Area Id of 0 is passed to the appropriate event handlers.

Page Viewer: Livescribe Desktop mode that allows users to view individual pages or sets of thumbnails of pages from their Paper Sources.

Page: Single piece of either dot paper (loose-leaf or bound), or the digitized version of one that Livescribe Desktop can recognize and interact with.

Paper Button: So called because it resembles an onscreen button in a standard computer application. A Pulse smartpen user can tap on a paper button to trigger particular functionality of the penlet.

Paper Product Developers: A team of developers that typically create one or more Livescribe dot enabled files used to print active paper. Typically, this team includes: graphic/production artists to create the layout and art for the paper and a Java developer who maps the paper art to static regions associated with the penlet application – a process called “shaping”.

Paper Product Only Application: Consists of paper definitions and the physical paper created by printing with these definitions. Paper products are installed on a Pulse smartpen (without penlet code). This paper is designed to interact with pre-existing penlet code on the Pulse smartpen. For example, a publishing company might want to create new notebooks for Livescribe, branded with a special background image.

Paper Product: Any open paper or note pad printed with any part of the dot pattern and that are used along with a penlet in an application. In general, the definitions and resources required to identify and print dot paper. Paper Products are represented electronically to Penlets and Livescribe Desktop as Anoto Functionality Documents (**AFDs**). See also **Custom Paper Product**.

Paper Replay: Pulse smartpen application that records audio (such as a lecture) at the same time that the user takes notes on Open Paper. Paper Replay synchronizes the notes with the recorded audio. Later, the user can tap on a note and play the audio that was recorded while that note was being written. The notes are considered indexes into the audio stream.

Paper Source: Any of the real-world or virtual paper sources that Livescribe Desktop can recognize and work with, including notebooks and journals.

Pattern Page: Identified by a page address: segment.shelf.book.page. For example, 1.2.3.4 denotes pattern page 4 in book 3, which is located on shelf 2 in segment 1.

Pencast: A type of content sharing via the web.

Penlet Developers: Java programmers who create the penlet application using the Livescribe Platform Java API and an IDE.

Penlet: Java application installed on the Pulse smartpen. Penlets are created using the Livescribe Platform Java API and are based on the Java Platform, Micro Edition (Java ME) and CLDC (Connected Limited Device Configuration). When a user taps (a penDown event) on an active region of a penlet, it will de-active the current running penlet and activate the new one. See **Syslet**.

Quick Commands: A series of commands you can write on dotted paper to quickly learn the current status of your Pulse smartpen.

Quick Record: A method of quickly recording with your Pulse smartpen. Activate Quick Record by pressing and holding your Pulse smartpen power button for two seconds.

Region Collection: A collection of regions on a single page of dot paper.

Region Id: An internal 64-bit number that uniquely identifies an Active Region to a smartpen. The Region Id encodes: Area Id, Instance Id, Occlusiveness, and Z-order, among other things.

Region Id: An internal 64-bit number that uniquely identifies an Active Region to a smartpen. The Region Id encodes: Area Id, Instance Id, Occlusiveness, and Z-order, amongst other things. An Active Region is a portion of paper. Active Regions may overlap in which case their Z-order defines the ordering of events delivered and their occlusive property defines whether active regions with lower Z-orders are processed at all.

Region: See **Active Region**.

Resources: Images and audio files used by a penlet. They are included in the project and are packed into the JAR when the penlet is built.

Session: (in Paper Replay). The audio (with or without linked notes) that is recorded between the time the user taps Start and Stop on the Paper Replay paper controls. Also known as a **Paper Replay Recording**.

Share: Upload file(s) to online account (myLivescribe), presumably for sharing with others.

Smartpen Application: The combination of a penlet and Paper Product that enables a Pulse smartpen to interact with dot paper.

Smartpen Movie: An animation that plays on the Pulse smartpen's OLED.

Smartpen: The Pulse™ smartpen, and subsequent generations of smartpens, sold by Livescribe.

Static Region: An Active Region specified by the developer in the paper product definition (see **AFD**). The dot paper usually has a printed graphic to indicate the location and usage of the static Region. For example, the Paper Replay control bar at

the bottom of each page in a Livescribe notebook is implemented as a group of static regions. See **Active Region**, **Dynamic Region**, **Claiming, Linking,** and **Fixed Print**.

Syslet: A special kind of system-level penlet that provides system-level functionality for menuing and volume control. Unlike normal penlets, when a penDown occurs on a Region ID of a syslet, the currently active penlet does not lose focus. See **Penlet**.

TTS: Text to Speech.

UGC: User Generated Content. Data generated by a Pulse smartpen user. This information can be shared with the Livescribe Online community.

USB Mobile Charging Cradle: The included cradle that charges and connects your Pulse smartpen to your computer.

User Input: The most common way for users to enter commands and data to a penlet is by writing or tapping on paper. User input is captured through smartpen events (such as penDown and strokeCreated) which are handled by a penlet.

Virtual Notebook: Collection of digitized pages gathered into a notebook that does not necessarily have a physical paper counterpart.

Virtual Page: Collection of ink or audio or both, gathered from other pages, collected into a digitized page that does not necessarily have a physical paper counterpart.

Web Services: A comprehensive set of on-line services to support users, developers, and Pulse smartpen partners.